Shell Answer Book #11

THE FOUL WEATHER DRIVING BOOK

Safety tips you should know when driving in rain, fog and snow

By Bruce Galbraith, Shell Plant Superintendent.

Come to Shell for answers

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Keep this book in your car. It could come in handy when the going gets rough.

How dangerous can driving in rain, fog or snow be? Don't find out the hard way.

Take a look at the tips in this book. They're tips that can help prepare you for an emergency. Tips that might save your life.

After gathering information from the National Safety Council, I talked with a movie stunt driver and with the head of the Los Angeles Police Department's Emergency Driving School. They told me some things about bad-weather driving that every driver ought to know.

Q. What's the best way to see, driving in a fog at night?

A. Use the low beam headlights. With your "brights" on, lights shine directly into the fog. And you see more glare than road. But with your low beam, the lights shine downward. So you see less glare and more road.

If you drive in a lot of fog, you may want to consider fog lights. If you get them, mount them low. They should be beneath the headlights but no lower than 12" off the ground.

About the author

Bruce Galbraith has been with Shell for 25 years. And he knows firsthand the problems bad weather can cause. Because for 17 years he drove a tank truck in all kinds of weather. And he drove it well, logging three quarters of a million miles without a single accident. The helmet is for some hazardous driving Bruce did for this book.

High beam *Low beam* *Low beam with fog lights*

We tried all three. In our test, low beam with fog lights made the biggest difference.

Q. Any other fog-fighting tips?

A. One basic tip we can offer is drive slowly but keep moving. Others are:

1. Turn lights and wipers on.
2. Use defroster to cut condensation on the *inside* of windshield.
3. Be especially alert. And keep a watchful eye in the rearview mirror for cars coming. If you stop too fast, they may not be able to.

Is he on the road or is he off?

He's off. *If you pull over during a fog, turn your flashers on. And if you have one, place a flare about three hundred feet behind your car. If you don't have flashers or flares, don't leave your taillights on. A car, seeing your taillights, may think you're still on the road, follow, and be unable to stop in time.*

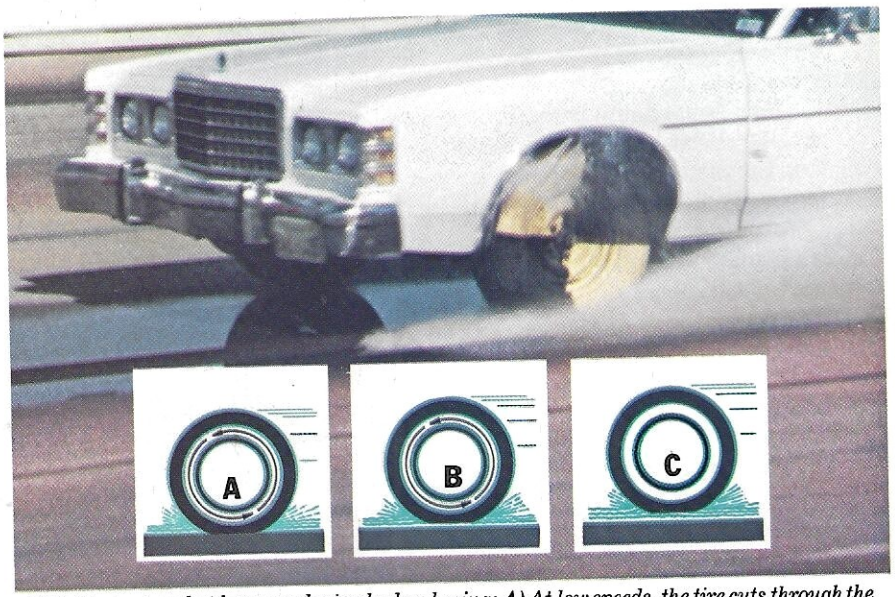
4. Watch out for cars creeping through the fog at a snail's pace. You'll be surprised how quickly you can be right on top of another car if you're not ready for it.
5. If you have to pull over on the side of the road, be sure to turn on your flashers.

Wet Weather Safety Hints

- Slow down when it rains. And decrease your speed even more when entering a curve.
- Allow more than the recommended space between you and the car in front of you. (It's usually one car length for every 10 miles per hour you're traveling.)
- Don't make any sudden moves with steering wheel, brakes or accelerator unless absolutely necessary.
- In a light rain, use your windshield washers before you turn your wipers on. There may not be enough rainwater to wash the film off the windshield, resulting in streaking when you turn the wipers on. And that can greatly reduce your vision.

If you must go through deep water, go slow. (Too fast and you may splash water on your ignition system, shorting out your spark plugs.)

- After you've gone through deep water, pump your brakes a few times to make sure they're still with you. If they've gotten wet and faded, shift into low gear and then drive slowly holding the brakes on lightly. Most of the time you won't have to go very far before they dry.
- Keep your headlights and taillights clean. Dirt that sprays up from the road can cut their lighting power. That sounds simple. But a lot of people neglect to do it.



*This illustrates what happens during hydroplaning: **A)** At low speeds, the tire cuts through the water and remains in complete contact with the road surface. **B)** At speeds around 30 mph, a water wedge may penetrate the tire-road contact and partial hydroplaning occurs. **C)** At speeds around 55 mph, the water wedge can increase and the tire can lose contact with the road surface, causing total hydroplaning. At this point you have virtually no control over the car. NOTE: In the photo, the car is traveling at 60 mph and the front wheels (riding on a layer of water) are not turning at all. This is total hydroplaning.*

Q. Does it have to rain hard to make roads slippery?

A. Not necessarily. Many roads are surprisingly slippery in the first few minutes of a rain. Water mixed with the dirt and oil that collected when the road was dry can make a soapy-slick film that takes a while to wash away. Our demonstration (opposite page) shows what can happen.

Trying to stop on damp roads can be as dangerous as trying to stop on wet roads. That's why it's important to slow down when it starts to rain.

After some safety instructions from stunt driver Tom Anthony, I got behind the wheel. As the photos show, I was able to stop quicker on a wet road than on a damp one. You don't have to creep along. Decrease your speed when the shower starts. And allow more distance than normal between you and the car in front.

Q. I have good brakes and new tires. Why should I slow down in the rain?

A. Hydroplaning is one reason. At higher speeds on wet roads, your front tires may actually be riding on a layer of water, much like water skis (see illustration above). And when that happens — and it's happened to me — it's gray hair time! You lose control of the car and it can start to drift to one side and go into a spin.

Q. What should I do if I start hydroplaning?

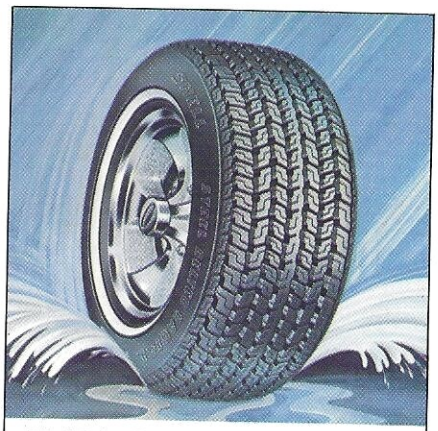
A. If you feel the front wheels start to "drift," take your foot off the gas, but don't touch the brakes or turn the wheel. As you slow, your tires will cut through the water, grip the road and give you control again.

Of course, it's best to try to avoid it altogether. Drive slowly on very wet roads. Don't overload the rear of your car hoping to get more traction. This makes the front wheels hydroplane easier. Check the tire pressure and the condition of your tires because worn tires are more likely to hydroplane than new ones.

Q. What else can I do to stay on the road in the rain?

A. Try to avoid sudden moves with the steering wheel. They can be dangerous. In fact, even slight moves can make a difference on a wet road.

When possible, drive in the tracks of the car ahead. They will be drier than the rest of the road. But don't keep your eyes down. Watch where you're going but don't tailgate.



Fight hydroplaning with Shell's Steel Belted Radials

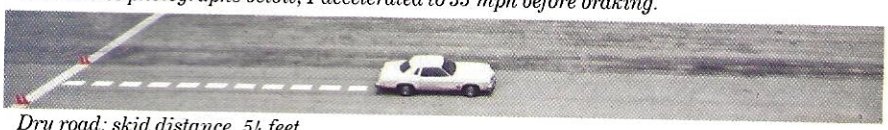
Shell's Steel Belted Radial is designed to resist hydroplaning and help keep you on the road.

The tread design uses seven ribs with cross slots to channel water from the center out the sides. That helps keep the tire on the road, not on the water.

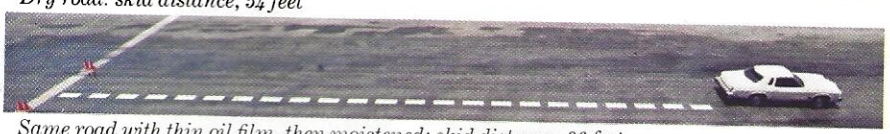
Shell's Steel Belted Radial has been performance tested to meet tough standards. Put it to work.

Ask a participating Shell dealer about the Shell Steel Belted Radial.

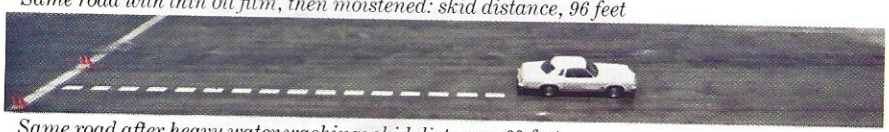
In the three photographs below, I accelerated to 35 mph before braking.



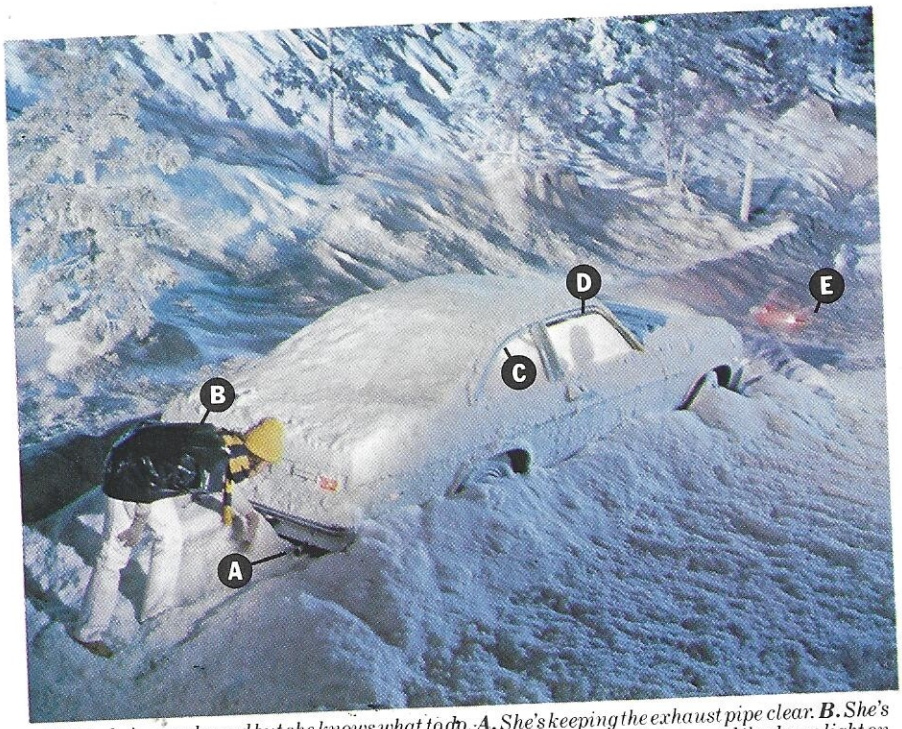
Dry road: skid distance, 54 feet



Same road with thin oil film, then moistened: skid distance, 96 feet



Same road after heavy water washing: skid distance, 69 feet



*This lady is snowbound but she knows what to do. **A.** She's keeping the exhaust pipe clear. **B.** She's wearing a plastic garbage bag as protection from the wind. **C.** She's turned the dome light on to check her passenger. **D.** She's cracked the window for ventilation. **E.** She's put out a flare so she'll be more easily seen.*

Q. I'm snowbound in my car. What now?

A. Don't panic. And stay with your car. It's your best shelter.

Run your engine and heater for only 10 minutes or so every hour. You'll stay warm enough, and you'll be conserving gas in case you're stuck for a long time.

When running your engine, keep your window cracked for air. And most importantly, make sure your tail pipe isn't covered with snow. If it is, deadly exhaust fumes could back up into your car.

Turn on your dome light occasionally at night so you can see how other passengers are holding up.

Tie a colored scarf or cloth to the fully extended antenna, and light a flare if you have one.

If you live in heavy snow country, plan ahead and provide for these two lifesavers ahead of time:

1. Keep a basic emergency kit in your trunk and know how to use it. (See box at right.)

2. Keep your tank at least half full even though it requires frequent gas stops. If you get stuck, you'll need the gas to help you run the heater at frequent intervals to stay warm.

Q. Is a wet road more slippery the colder it gets?

A. No, actually the road is most slippery right at 32 degrees, when water may not freeze completely, leaving the added hazard of water on ice. Any time the temperature is anywhere near freezing, assume the road ahead is icy and reduce your speed accordingly. Or, find a motel for the night.

Remember that bridges and overpasses may freeze before the rest of the road because the air is cooling them from both above and below.

Q. Are starting problems on cold mornings always caused by the battery?

A. No. Surprisingly, a weak battery is often a result rather than a cause. One national survey showed that 56 percent of cars with winter season starting problems still had the problems after getting a battery charge or a new battery. The *cause* could be something else. Like the ignition system or carburetor adjustment.

A tune-up can be a big help for fast starts on cold mornings. Ask your Shell dealer about it.

A basic winter emergency kit:

1. Steel shovel.
2. Matches.
3. Candles or several containers of canned heat.
4. Metal coffee can.
5. Two plastic garbage bags or large sheet of plastic.
6. Sand.
7. Flares and flashlight.

The shovel and sand will help you get out if you should get stuck. Use the candle or canned heat to melt snow in the coffee can for drinking water. (Don't eat snow; it will just chill your system further.) The candle and can will double as a foot warmer. The garbage bags are great insulators against the wind if you must step outside the car.

A luxury survival kit might also include some extra warm clothing, nonperishable foods, a compass and C.B. radio.

Your Shell dealer can help you fight foul weather

Ask him about Shellzone® Antifreeze/Coolant. It protects your engine and keeps it from freezing up when the temperature plunges. And it protects against rust and corrosion year round.

Shell Windshield De-Icer removes ice and frost from windshields and windows. It melts compacted snow and it can thaw frozen locks and door jambs.

Shell Windshield Washer Solvent works in your windshield sprayer to clean in all kinds of weather.

Q. Snow tires or chains, which are better on icy roads?

A. On glare ice, snow tires just can't compete with chains. At 20 mph it took a car with snow tires 151 feet to stop. The same car with regular chains did it in half the distance.

Q. Any other winter suggestions?

A. You know the old saying about an ounce of prevention. If you'll always be conscious of the things that might happen, you can do plenty of little

things to keep them from happening. Keep windows clear of ice and snow on all sides. If you can't see a hazard, you can't avoid it.

If it's icy, try not to parallel park. It's a lot harder to get moving if you have to turn your wheels.

Don't decrease tire pressure in an effort to gain traction. You won't get more traction and you will get more tire wear.

Don't spin your wheels if you're stuck. That may only make it worse.

When stopping, let off the accelerator slowly and earlier than normal. Then pump your brakes gently instead of jamming them on.

If you start to skid, steer in the direction the rear of the car is sliding. (Shell's Driving Emergency Book has more information on this. See address below.)

Q. Any more questions?

A. Write me. If you have any questions about the information contained in this book, write: Bruce Galbraith, "Foul Weather Driving," P. O. Box 61609, Houston, Texas 77208.

THE EARLY WARNING BOOK
THE BREAKDOWN BOOK
THE GASOLINE MILEAGE BOOK
THE CAR BUYING & SELLING BOOK
THE 100,000 MILE BOOK
THE RUSH HOUR BOOK
THE DRIVING EMERGENCY BOOK
THE CAR REPAIR & SHOPPING BOOK
THE CAR CRIME PREVENTION BOOK
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How to get more answers from Shell. *Get all the books in the Answer Series. They're free at many Shell dealers. Or write Shell Answer Books, P.O. Box 61609, Houston, Texas 77208. Watch for more books on new subjects coming out soon. NOTE: Shell would like to thank the National Safety Council for its cooperation. This booklet is based on information from the Council and has been reviewed by it. These are general recommendations that we believe will be helpful in many emergencies. Since every emergency is different, the individual driver must decide what to do in any particular case.*

Come to Shell for answers

Shell Answer Book #12

THE UNEXPECTED DANGERS BOOK

Some car products are dangerous if used the wrong way. Here are the right ways.

By Jerry Berger, Shell Product Safety Specialist

Come to Shell for answers

Without knowing it, millions of people risk serious injury with gasoline, car batteries, and engine coolant. Do you?

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Are car products dangerous? No, not unless they're misused. But when they are misused the answer is definitely yes. An estimated 40,000 people are burned in gasoline accidents each year. A car battery can explode in your face if you do the wrong thing to it.

To prepare this book, I got a lot of facts like these from the Consumer Product Safety Commission, the National Safety Council, and Shell's own technicians.

But facts and figures aren't very threatening. They seem to be about the other guy.

So I blew up batteries, set fires with gasoline, even scalded a dummy to get a closeup look at some ways people can hurt themselves.

The results of our "danger demonstrations" were revealing. And sometimes frightening. And even though it's my job to know what's safe and what isn't, I learned some new things about how to look out for myself and my family.

Q. Is it safe to clean things with gasoline?

A. Never.

Gasoline is tricky stuff. It vaporizes very easily, and the invisible vapors are heavier than air. (See photo, right.) They can spread along the floor to a water heater, an electric motor, a car's engine, or something else that can ignite them.

Never use gasoline as a cleaner, a charcoal starter, or a solvent — not *anything* except fuel for a gasoline engine.

Q. Suppose I have a gasoline fire. What's the best extinguisher?

A. It's usually best to forget about fighting the fire, get everybody away from it, and call the fire department.

For fighting a fire yourself, note the pictures opposite. They show our test of four ways to fight a gasoline fire in a pan. There are other ways of course.

The car parts and brush are in the picture to remind you that a lot of

Photographed with special lighting, invisible gasoline vapors cast a shadow as they drift out of our beaker and fall toward the floor. Vapors like this can "crawl" across the ground and reach an ignition source a great distance away.

1. A straight stream of water *actually spread the fire further. Burning gasoline splashed out of the pan, floated on the water, and kept right on burning. The heat got so bad, I had to duck away.* **2. A spray of water** *worked a little better. At least it didn't spread the flames. But I had to hold the hose just right, and it took a long time. If the fire had been in somebody's garage, it might have been too long.* **3. A dry chemical extinguisher** *snuffed out the test fire in just a few seconds. I think anyone who uses gasoline at home should have an extinguisher like this. The ones marked for "type B" fires are for gasoline and other flammable liquids.* **4. A garbage can lid** *killed the fire by cutting off its air supply. A shovel full of sand, a piece of plywood, a tarpaulin, anything that will cut off the air supply and won't burn easily might work. The trick is to let it sit there and smother the fire for a long time. If you remove it and let the air back in too soon, hot vapors re-ignite.*

people who clean parts with gasoline end up doing their own fire extinguisher demonstrations.

Q. Are you saying I shouldn't even have gasoline in my garage?

A. No. But if you do, take these precautions.

First, keep it in a safety can like the one in the photo on the next page. These are expensive cans, but cheap fire insurance.

Next, keep only a small amount, enough for your immediate needs. No sense having five gallons around if you only use a gallon a month.

Put the can in a place that's well ventilated and away from ignition sources. And keep it out of the reach of children even if you have to lock it up to do so. The best place would be

Gasoline Safety Can

Spring cap lets pressure escape, resists spills.
Flame arrestor in neck keeps flame from following vapor trail to inside.
Short, fat shape makes it hard to tip over.
Clear labeling helps prevent mistakes.
GASOLI

somewhere separate from your living area, like a detached garage or shed.

And never carry extra gasoline in the trunk of your car.

Q. Even gassing up my mower could be risky, then, couldn't it?

A. Yes. But four things will cut that risk. Do them when you fuel any small engine.

First, get away from ignition sources. Don't smoke.

About the author

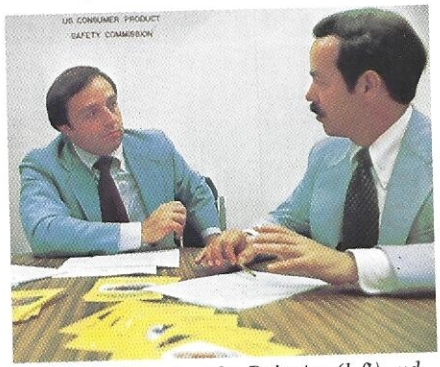
Dr. Jerry Berger (the doctorate is in physical chemistry) has been with Shell for 18 years. His present work concerns safety, health standards, and environmental protection regarding both Shell products and Shell plants.

"Things like these fire-fighting tests always give me a better outlook on my job," he says. "Safety isn't just reports and regulations. Safety makes the difference between a healthy human being and an injured one. That difference is worth an extra effort."

Second, have plenty of ventilation. Do it outside, not in the garage.

Third — and this is the one people ignore most — don't refuel an engine that's running or still hot. It can set off the vapors. Take a break to let the engine cool before you fill up.

Fourth, pour carefully. Use a funnel. And clean up spills before starting the engine.



Commissioner S. John Byington (left) and others from the Consumer Product Safety Commission provided me with a lot of safety information and helped select subjects to be covered in this book. Gasoline and other flammable liquids rank ninth out of 375 on the Commission's Hazard Index, a rating based on how frequently and how badly people are hurt.

Q. My child swallowed some gasoline! What do I do?

A. First, get gasoline and child apart. He might drink more. If he spilled it on himself, get the wet clothing off and wash him with warm water and lots of soap to prevent chemical burns.

Then call a Poison Center or a doctor right away. Get those numbers now and keep them by the phone so you don't waste heartbeats looking them up. If there's no poison center in your phone book, get

the number in advance from the operator.

Now what *not* to do. When someone has drunk gasoline, do *not* make him throw up *unless* the doctor or Poison Center tells you to. Sometimes throwing up can make it worse. The same is true for kerosene, lighter fluid, and fuel oil.

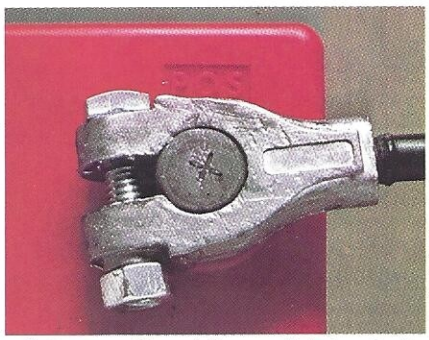
Of course prevention would have been better. Keep gasoline away from children. When you have the gas can out, don't leave them with it for a second. One *teaspoonful* can be fatal to a small child.

And never start syphoning by sucking on the hose. Kids aren't the only ones who get poisoned.

Q. Can car batteries really explode?

A. Yes. Battery explosions are not common, but when they happen they can be very bad, as the picture on our cover shows. In our danger demonstration, battery acid splashed

This battery was blown to pieces by its own explosive gases. We caused a spark inside the battery with a remote switch. The same thing can be caused by a tiny spark when hooking up jumper cables. Only instead of being 20 feet away behind a shield, as our photographer was, you'd be standing next to the blast.



Battery markings tell you which terminal is which. The positive terminal will be marked with "pos," "P," or "+." The negative with "neg," "N," or "–."

everywhere. Sharp pieces of the battery went flying.

One cause of battery explosions is the spark that happens when you connect jumper cables.

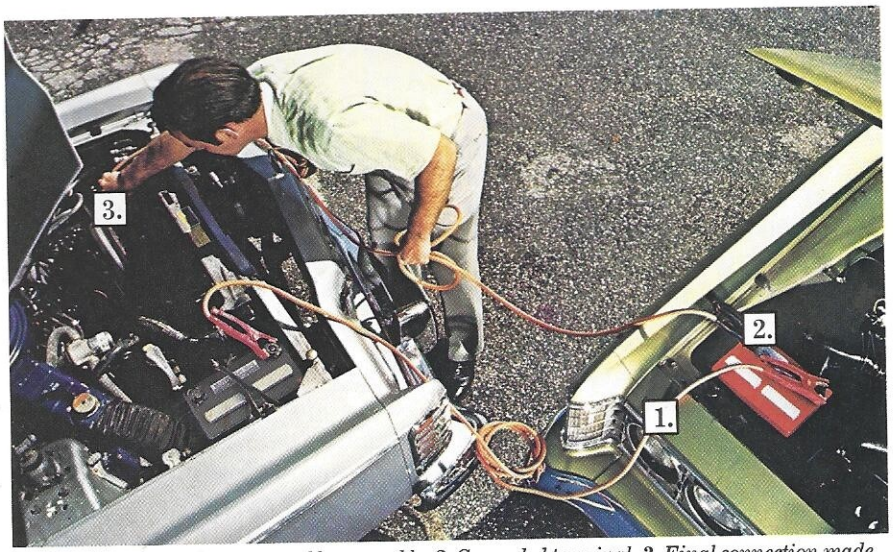
You see, the chemical reaction inside a battery produces an explosive mixture of hydrogen and oxygen. Usually, this gas mixture escapes a little at a time through vent holes and no harm is done. But sometimes, when a lot of it collects in and around the battery, and something ignites it, pow!

The vent caps on some batteries have flame arrestors. If the gases around the battery ignite, they help keep the flame from getting inside and blowing the battery apart.

Q. But I've got to jump-start my car. What's a safe way?

A. The trick is to keep the spark and the gases from getting together. Here's how.

1. Make sure the two cars are not touching. Set both parking brakes, put both transmissions in park or neutral, turn off ignition, lights, and



1. *Positive terminals connected by one cable.* **2.** *Grounded terminal.* **3.** *Final connection made to bare metal part on engine or engine block itself, not to battery terminal.*

accessories on both cars.

2. Make sure the two batteries are the same voltage.

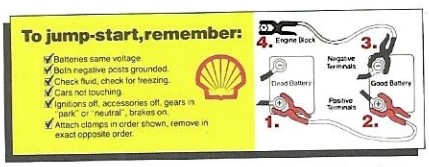
3. One terminal of each battery is "grounded," that is, connected right to the engine block. Make sure the negative terminal is the grounded one on both cars. It is on all modern American cars and most foreign cars*. (See photo on previous page to tell which terminal is positive, which negative.)

4. Add water to any battery cells that are too low. Never jump-start a battery if the fluid inside is frozen. There might be gas pockets in the ice.

5. With the red-clamp jumper cable, connect the positive terminals of the two batteries. Make sure clamps are tight so they won't spark. Wiggle each one to get a good "bite."

6. With the black-clamp cable, connect the negative terminal of the good battery *to a bare metal part bolted directly to the other car's engine block or to the block itself.* This is the same as connecting it to the terminal because the terminal is grounded to the block. But this final connection is the one that sparks, so you want it to be far from the battery.

*It is possible to jump-start cars with positive or mismatching grounds, but the procedure is not the one given here.



Get this free sticker from participating Shell dealers. It shows the safe way to connect jumper cables. With the sticker under your hood, the instructions will be right where they're needed. Also available from Shell Oil Company, P.O. Box 61609, Houston, Texas 77208.

Keep cables away from fans and belts and be careful not to touch black clamps to red ones.

7. Try to start the car with the dead battery. If it won't start the first time, start the booster car and let it run a few minutes before trying again.

8. Remove clamps in *exact reverse* order. The first one you disconnect will cause a spark, so remove the one farthest from the battery first.

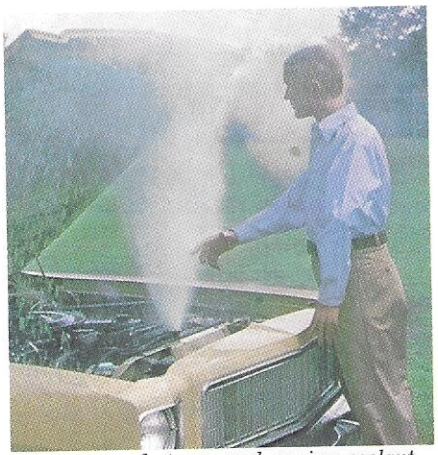
After seeing how a battery can blow, I'll never jump-start a car without doing these steps.

Q. My car's overheating. How do I cool it safely?

A. Pull safely off the road, shut off the engine and wait.

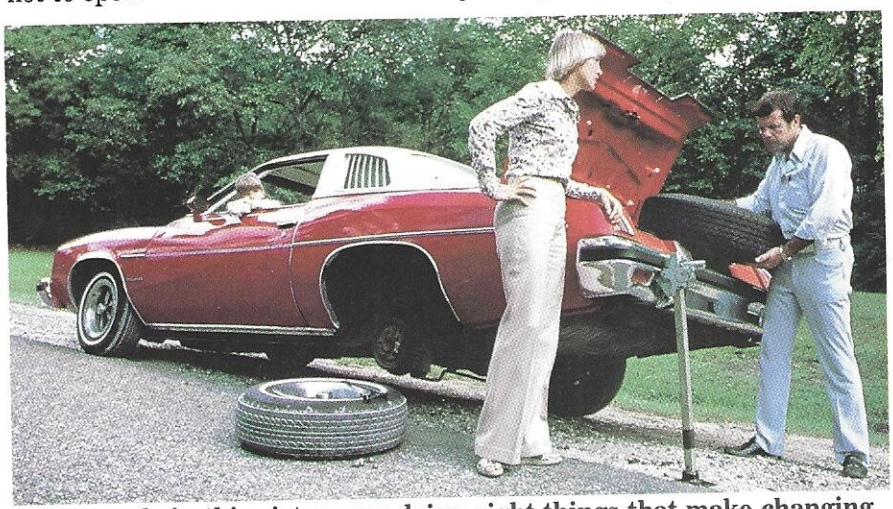
Whatever you do, don't open the radiator cap. You could end up like our test dummy in the picture.

A rule of thumb: If the radiator is too hot to rest your hand on, it's too hot to open.



A geyser of steam and engine coolant scalded our test dummy when we opened the radiator cap of this overheated engine by remote control. A car doesn't have to be steaming to be hot enough to do this. When the cap is opened, pressure drops, and coolant can boil instantly.

A coolant overflow tank lets you check the level without opening the cap. If your car has no overflow tank, you might want to add one.



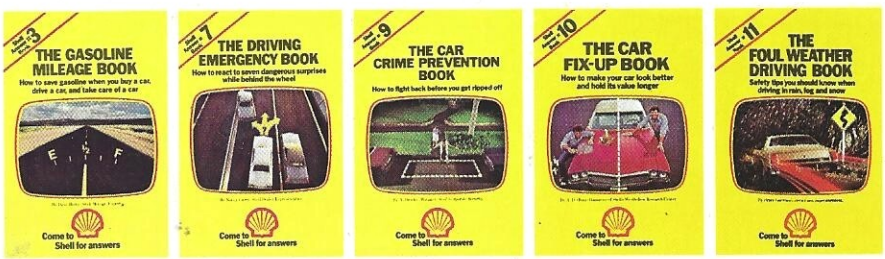
The people in this picture are doing eight things that make changing a tire dangerous. Do you know what they are? (Answers on back page.)

Q. Any more questions?

A. Ask me about subjects in this book. Write Jerry Berger, Shell, P.O. Box 61609, Houston, Texas 77208. And you can get battery and gasoline facts from the Consumer Product Safety Commission, Washington, D.C. 20207.

Attention Shell Customers:
Shell will be happy to provide you with additional technical information on the safe handling of our products. Write for information on fuel oils, gasoline, lubricants, LP gas, or turbine fuel.

Answers 1. Car too close to road. 2. Car parked on sloping shoulder. 3. Jack is leaning because it wasn't positioned properly before the car was raised. 4. Woman standing too close. Could be hurt if car slid off jack. 5. Child in car might rock it off jack. 6. Spare should have been taken out before jacking so jolting doesn't knock car off jack. 7. Front wheels not blocked. 8. Flat tire lying in road. Some other safeguards that wouldn't show in the picture: Parking brake should be on. Warning flashers should be on. Automatic transmission should be in "Park," stick shift in gear.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Shell would like to thank the Consumer Product Safety Commission and the National Safety Council for reviewing this booklet. This does not imply an endorsement of Shell products by either organization. The jurisdiction of the Consumer Product Safety Commission does not cover all the products discussed in this booklet.

Come to Shell for answers

Shell Answer Book #14

THE DRIVING SKILLS BOOK

Are you as good a driver as you think? Test yourself.

By Carol Nau, Shell Sales Representative

Come to Shell for answers

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You may be surprised at what you *don't* know about driving. Take a few minutes to find out. And keep this book for future reference.

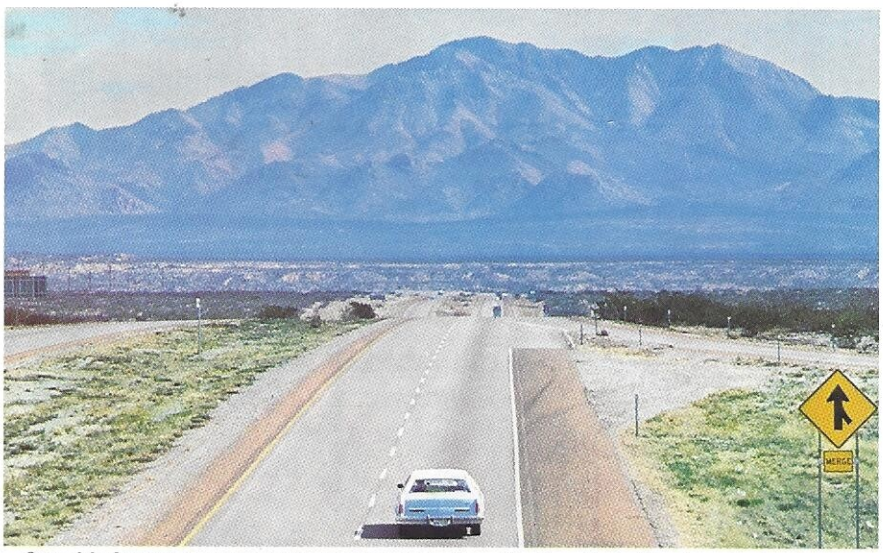
If you're like me, you've driven plenty of miles without an accident. Imagine my surprise when I concluded that my safety record was due more to luck than to skill. Here's how I reached that decision:

Since I'm not an expert, I did a lot of digging. I gathered information from the National Safety Council. I took Bob Bondurant's Advanced Street and Highway Driving Course.

I interviewed a Los Angeles chauffeur who's driven celebrities around that city for over 25 years. And I got some good advice from Margaret Jones, Ph.D., a noted psychologist involved in driving safety research at the University of Southern California.

My sources were very different. But they all agreed on one thing: driving skills include much more than just being able to physically control a car. In fact, the deeper I delved, the more I found that a driver's mental attitude, his "mind set," is what's really important.

Finally, I put my findings to the test by driving 1700 miles from Los Angeles to Houston. A trip on which



One of the biggest problems I had on my journey from Los Angeles to Houston was keeping my mind on my driving. The mind can easily wander. And fatigue increases that danger. Stop every couple of hours and stretch. It'll help keep your body, as well as your mind, alert.

I was able to use all the skills I had learned from the experts.

Q. What are the most important skills in driving?

A. There are two basic skills that I think are the most important. One is what Dr. Jones calls *tracking*. By this, she means the physical ability to drive a car from point A to point B. The other she calls *detection*. And that's often the hardest part. Being able to sense what's happening around you and detecting potentially dangerous situations. To be a really good driver you must master both. And that requires using *tracking* and *detection* at one time. It's not easy.

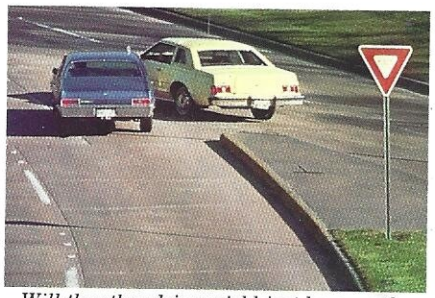
Q. Which are more important — physical or mental driving skills?

A. You really can't separate the two. How fast you *react* to something on the road is often dependent on *when* you realize an action must be taken. The more vigilant you are about the task of driving, the more likely you will be to detect and respond quickly to a potential problem.

About the author

Carol Nau joined Shell after graduation from UCLA. Trained as a biochemist, she is now a sales representative for Shell Chemical. Carol will be spending about sixty percent of her time on the road.

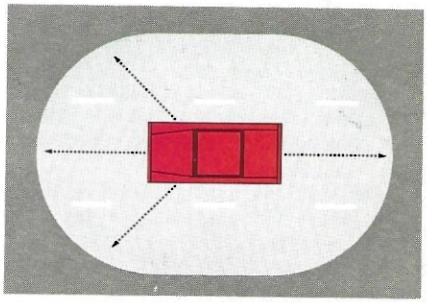
Her 1700-mile drive (to test her newly acquired skills) from Los Angeles to Houston was not the first time she had made that trip by car. "But I felt a lot safer this time," Carol said, "because I had more confidence in what I was doing."



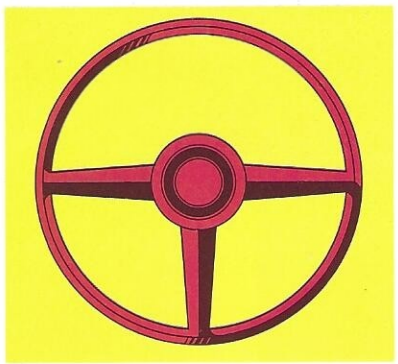
Will the other driver yield just because the sign says to? Don't bet your life on it. You might lose.

Q. Is there one driving technique that's better than others?

A. Defensive driving is the best technique. To be a good defensive driver you have to be alert. And the more alert and attentive you are, the better you drive. Joe Fagan, the chauffeur, gave me a good tip about defensive driving. He said that he builds a *moving oval of space* around



his car. As he drives, he tries to position himself so that he's got space all around. That way he can move right or left, forward or backward, to avoid trouble. Traffic conditions make this difficult to do all the time. But when Joe has the chance, he does it, because he stays on the defensive.



Skillful Driver Pledge

I will enjoy driving more and maintain a good mental attitude by following these steps:

1. I will be courteous to other drivers and cooperate with them by driving friendly.
2. I will consider safety above all else.
3. I will feel responsible for all who ride with me.
4. I will remain calm and vigilant at the wheel.
5. I will keep an especially watchful eye for pedestrians.
6. I will try to help other drivers when they are in difficulty.
7. I will remember that the roads belong to two-wheeled vehicles as well as cars.
8. I will see that regular maintenance and safety inspections are performed on my car.
9. I will not drive if under the influence of drugs or alcohol.
10. I will obey all traffic laws.

Take the Skillful Driver Pledge. *Will you make a commitment to become a better driver? Self-awareness is the beginning. We'll give you a free Skillful Driver Pledge you can stick inside your car so you'll be reminded of your commitment every time you drive. Just stop by a participating Shell dealer and pick one up. If you like, get more than one.*

Bob Bondurant told me that keeping your hands at the 9 o'clock and 3 o'clock positions gives you the maximum amount of steering wheel maneuverability.

Q. What's the correct position for your hands on the steering wheel?

A. Many people are taught that the 10 o'clock and 2 o'clock positions are best. But Bob Bondurant says the 9 o'clock and 3 o'clock positions are better. You have more control and your arms will be less likely to tire.

Q. The speed limit is always a safe speed. True or false?

A. False. Speed limits are set for the best driving conditions. Slow down in heavy traffic, darkness and bad weather. But remember, if you're on a freeway, don't go too slowly. That can be very dangerous. Concentrate on staying within the speed limit and "going with the flow."

Q. Are there any tricks to keeping your mind alert while driving?

A. One way is to keep your body alert. Sit up straight in the seat with your buttocks deep in the seat. Your car will tell you how it's responding. But you have to listen with your body as well as your ears. When you turn a corner too swiftly, you'll feel it first in your bottom and your legs.

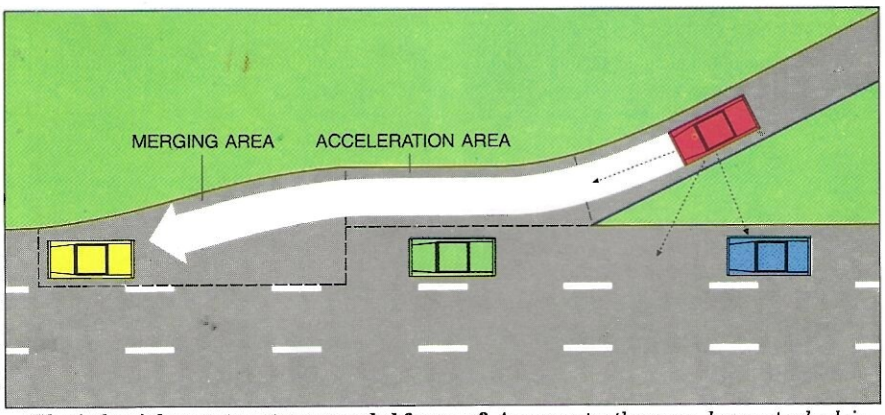
If there's a handling problem you'll notice it first in your hands and your arms.

You should be comfortable while driving, but not so comfortable that you aren't prepared for the signals your car can give you.

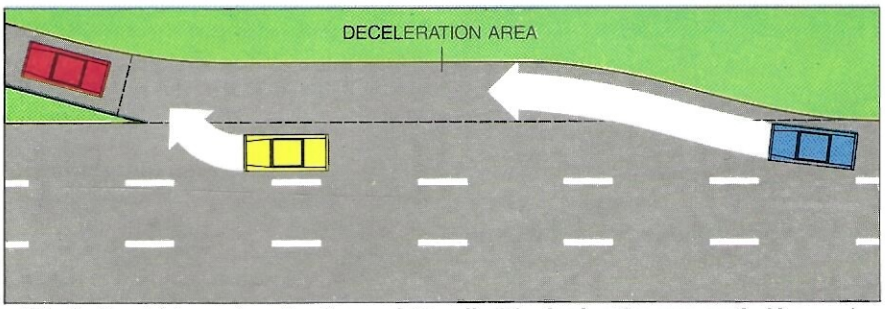
Q. Any tips on making turns at busy intersections?

A. Here's a tip on what *not* to do. Don't be in such a hurry to turn left that you turn your wheels *before* you start to make your move. Leaving your wheels straight is a defensive technique. Why? Because if you are struck from the rear and your wheels are turned left, you'll be knocked into the path of oncoming traffic.

When you're making any turn, stay in the same lane. Don't swing wide into a different lane. Besides taking more road than you need, you could really be inviting disaster.



What's the right way to enter a crowded freeway? *As you enter the ramp, be sure to check in front, to the sides and behind you as the red car is doing. Time your approach to blend into the traffic in the merging area. Don't make any sudden stops in the acceleration lane. Being smooth and alert are the keys to entering a freeway properly.*



What's the right way to exit a freeway? *Use all of the deceleration area as the blue car is doing. A quick exit at freeway speed, as the yellow car is doing, means you'll be traveling too fast when you reach the ramp. The red car should be traveling at ramp speed, which is considerably lower than freeway speed.*

At least a two-second interval, regardless of speed, is now recognized as a safe following distance. But if conditions are not ideal, allow more space.

Q. What's a safe following distance?

A. The familiar answer is at least one car length for every 10 m.p.h. But there's a better answer: *at least a two-second interval.* To use it, simply select an object along the roadside ahead. When the car in front of you passes it, start counting "one-thousand-one, one-thousand-two . . ." You should finish "one-thousand-two" as you reach the object. If you reach the object first, you're too close.

Q. How should you shake a tailgater?

A. *Don't* hit your brakes and try to scare him out of his wits. He may not react quickly enough and plow right into you. *Don't* let him intimidate you into driving too fast. Gradually slow down and give him every opportunity to pass. If he's really in a hurry, he'll go around you when you slow down.

Q. How should you react when people cut in front of you?

A. You're following at a safe distance and someone cuts in front of you. You back off to a safe distance and someone does it again. What next?

Believe it or not, the answer is to back off again. If you get frustrated and start following too closely, you're only increasing your chances of a possible rear-end collision. Keep a level head. Never let emotion get the best of you.

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Shell X-100® single grades are available in SAE 10W, 20W-20, 30 and 40. Each meets the warranty service requirements of every U.S. car and most foreign cars.

Shell X-100 Multigrade is an SAE 10W-40 all-season oil offering excellent high-temperature protection plus good low-temperature startability. Meets or exceeds warranty requirements.

Shell Super X® earns the 10W-50 rating, the widest multigrade range you can buy. Helps protect today's hotter running engines. Exceeds warranty requirements.

Tips from the experts

Good driving requires more than being able to answer questions correctly. Attitudes and expectations are equally important. I'll let our experts explain.

Dr. Margaret Jones

"Perception is a problem for many drivers. Many people look but don't see. Accidents often happen because people don't notice the situation as it develops. Try to notice what is going on around

you. Use the rearview mirror often. Many drivers use it only about a third as often as they should. Keep your eyes moving.

"Driving is a task. Never go driving to calm down. Take a walk instead.

"Think of driving as a succession of risks. Every time you change lanes in traffic you increase your interaction with other cars, and that increases your risks. Ask yourself how many chances you want to take in order to get from Point A to Point B."

Joe Fagan

"Never decide what somebody else is going to do. Expect other drivers to do anything and everything. Don't bet your life on what you *think* another guy will do. It could be the last bet you make.

"Simply pay attention. Drivers day-dream too much. Be attentive. Make sure you have an escape route — a way

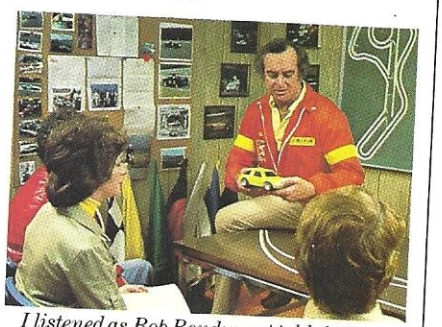
Joe Fagan, a professional chauffeur, pointed out a common traffic hazard, the "constant lane changer." Changing lanes in traffic doesn't always save time. And it's dangerous.

to avoid an accident if a hazard suddenly comes up. Watch for small signals. For example, an out-of-state license plate means a driver who probably doesn't know the territory. Watch him."

Bob Bondurant

"Don't act out racing fantasies on the road. Competitive driving is great — on the race track. It has *no* place on the freeway.

"A car is not a living room on wheels. A car is a powerful machine. Driving it is a major responsibility. It requires alertness, awareness, and constant preparation for emergencies. Don't allow yourself to get *too* comfortable behind the wheel."



I listened as Bob Bondurant told the class about what happens when you "slam" on the brakes. More of the car's weight is thrust onto the two front wheels, and the back of the car can go out of control.

Q. So what does it take to be a skillful driver?

A. If I were to wrap up everything I learned into one package, I would simply encourage everyone to remember these three C's of driving:

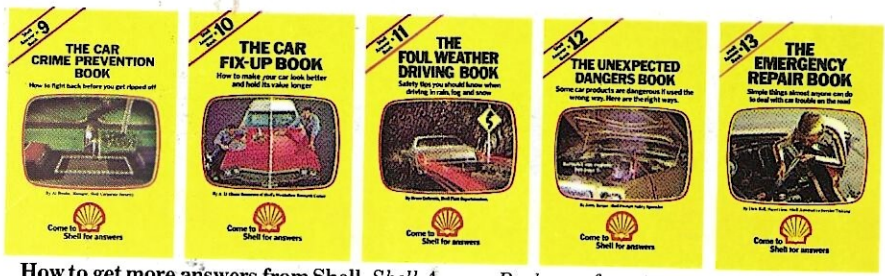
Cooperation: As Bob Bondurant said, competition has no place on the road. Be friendly and courteous. Help other drivers. You would want them to help you.

Communication: Don't isolate yourself. Let other drivers know what you plan to do. Use your signals.

Concentration: Perhaps the most important thing of all. Keep your mind on your driving. Remember that driving is a task. Be vigilant in your efforts to stay alert. A skillful driver is a safe driver.

Q. Any questions?

A. I learned a lot, and I put what I learned to work. You can do the same. If you have any questions about the information in this book, I'll try to get the answer for you. Write Carol Nau, Shell Oil Company, P.O. Box 61609, Houston, Texas 77208.



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Shell would like to thank the National Safety Council for its cooperation. This booklet contains material from the Council and has been reviewed by it.

Come to Shell for answers

Shell Answer # 16 Book

THE HOME SECURITY BOOK

Easy, inexpensive ways to help protect your home from intruders.

By Dick LaFaver, Shell Senior Security Representative

Come to Shell for answers

Read this book carefully.
Then share it with someone you care about.

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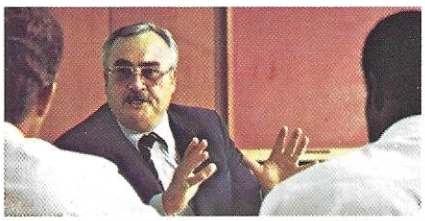
Every year, there are hundreds of thousands of illegal entries into homes across America. They frequently result in burglaries, assaults, rapes, injury, even death.

To learn more about how this happens and what each of us can do to help prevent it, I talked with several convicted burglars. And I went along with police officers from my city's Crime Prevention Bureau as they inspected the homes of several of my co-workers. All too often they found areas of the homes that were vulnerable to forced entry.



I interviewed several convicted burglars to learn what they look for when picking their "targets."

Many homes can be made far more secure with relatively little trouble and expense. Once you read this book, you should have a good idea of how you can help protect your property — maybe even your life — from the threat of an intruder.

Q. What's the use? If a burglar wants in, he'll get in. Right?

A. Not necessarily. Most burglars are amateurs in search of an "easy mark" — a house that can quickly be broken into. They're looking for valuable merchandise that can easily be removed and sold.

You can help take your house off the "easy mark" list by (1) making forced entry difficult, (2) keeping valuables in a safe deposit box at the bank, and (3) permanently marking other items with your driver's license number to make the merchandise easier to identify as stolen and, therefore, harder to sell.

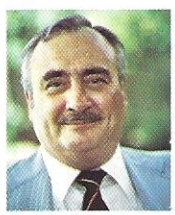
These steps can make your house much less attractive to a prospective burglar. And just a little discouragement can send him off in search of an easier target.

Q. My doors already have locks. What else do I need?

A. Take a good look at those locks. Just because *you* can't get in without a key doesn't mean the same is true for a burglar. Some locked doors can be opened in seconds with just a plastic credit card.

If someone lived in the house or apartment before you, have the cyl-

About the author



Richard N. "Dick" LaFaver was a special agent with the Federal Bureau of Investigation from 1951 to 1956, when he joined Shell. He has since been active in the security of Shell plants, refineries and offices. For the past seven years, Dick has investigated and assisted in the prosecution of major thefts. He also advises Shell local managers on security measures.

I went with members of our local police department's Crime Prevention Unit to inspect several houses, townhomes and apartments for vulnerability. They pointed out how to recognize an inadequate lock, how to trim bushes away from windows so burglars can't hide and work behind them, and how to secure sliding glass doors in their tracks.

inders in the locks changed. It doesn't cost much, and it's just as effective as putting in new locks.

Check your windows, sliding glass doors and garage. They should be kept securely locked at all times when not in use. If your garage is attached to your house, the door between them should be locked as securely as any exterior door. Check the chart on page 4 for some of the safer locks to use.

A lock is only as good as what it's attached to. Doors should be solid core or metal. And when screwing into door and window frames, use 2″ to 2½″ screws to reach into the solid wood studs behind the frames. Then *use* your locks. Even if you only leave the house for a few moments, lock up behind you. And don't hide a key outside the house.

Q. Why lock windows? Won't a burglar just break the glass?

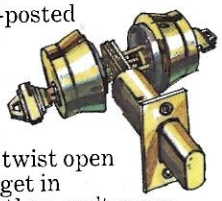
A. Burglars don't want to be seen or heard, so they usually won't risk breaking glass to enter a home. Be sure to use whatever locks are already on your windows. Then, screw the windows shut. (See chart on page 4.) That should discourage most burglars.

With the windows screwed shut, it's important to teach family

KEYS TO SECURITY

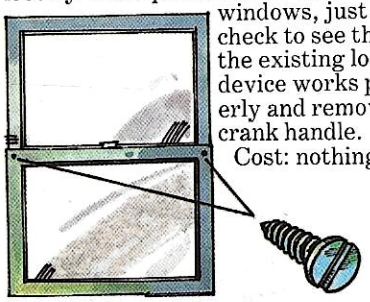
The security devices on this page were recommended by our local police department. You should be able to find everything you need at a hardware store or locksmith's shop.

All exterior doors need quality deadbolt lock with 1" throw. For maximum protection, a non-posted double cylinder deadbolt. Key required inside and out. Burglars can't break nearby glass and twist open lock. And if they get in through window, they can't carry goods out door. Cost: around $25 to $40.

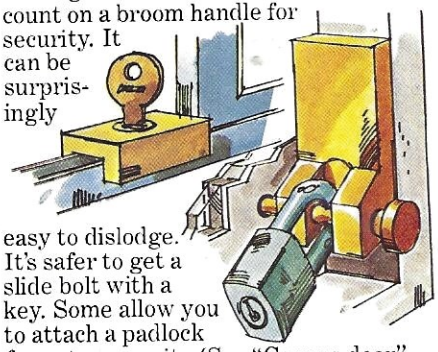


Peephole with wide-angle lens lets you see who's outside without opening door. Much safer than a chain lock. To install, drill small hole in door at eye level. Insert the viewer and twist to tighten. Cost: probably under $3.

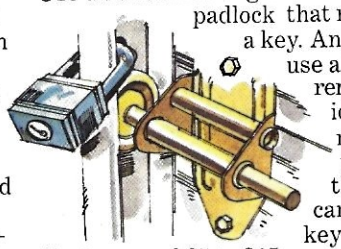
Windows can be inexpensively secured by simply screwing them shut. Drill small hole through interior frame, partially into exterior frame. Insert sheet metal screw long enough to reach into exterior frame. For windows frequently opened for ventilation, drill hole at downward angle and insert nail loosely. Cost: pennies. For casement windows, just check to see that the existing locking device works properly and remove crank handle. Cost: nothing.



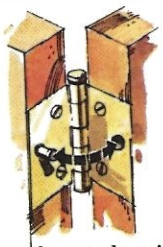
Sliding windows and doors. Don't count on a broom handle for security. It can be surprisingly easy to dislodge. It's safer to get a slide bolt with a key. Some allow you to attach a padlock for extra security.(See "Garage door" section below for padlock specifics.) Cost: around $5 to $10.



Garage doors can be easily secured with a padlock through the roller track. Use a double-locking hardened steel padlock that requires a key. Anytime you use a padlock, remove any identifying numbers on the lock, or the burglar can order a key to fit it. Cost: around $5 to $15.



Pin door hinges on all exterior doors so the doors cannot be removed, even with the hinge posts out. Especially important for doors that swing outward and have hinges exposed on the outside. On each hinge, remove two opposite screws. Drive sturdy nail into screw hole in doorframe, leaving ½" protruding. Widen opposite screw hole with drill so nailhead fits in when door is closed. Cost: pennies.



members how to get out in case of fire. Don't take time to unscrew the windows. Throw something like a chair through the glass, cover the broken edges with a blanket, and crawl out.

Q. How about bars on my windows and doors?

A. You could probably secure your home effectively without bars, but if you live in a high risk neighborhood, you might feel safer with them.

For greatest security, have them installed inside the house where the burglar can't easily remove them. And be sure there are "escape hatches" in case of fire.

Q. Burglar alarms can cost a lot. Are they necessary?

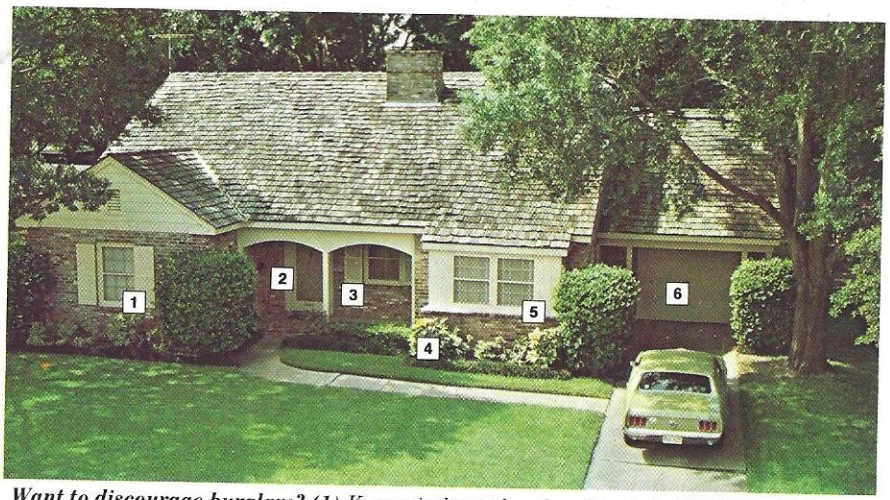
A. For many homes, no. Often a home can be made quite secure without an alarm. But there are some instances when you might feel more comfortable with a burglar alarm. For example: **(1)** if your home is isolated from view; **(2)** if it contains many valuable items such as art, coin or stamp collections, furs or fine jewelry; or (3) if you're living in a burglary-prone neighborhood.

There are many different types of alarms available. Ask your local police for their recommendations.

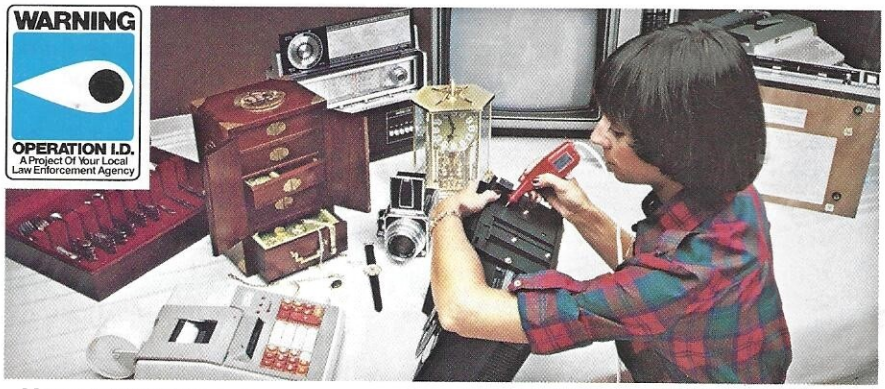
Q. What about theft insurance?

A. It's a good idea to have it. Homeowners and tenants can frequently insure their possessions against theft for a surprisingly low cost.

Once you're insured, make an itemized list of *everything* you own. Include brand name, model number, serial number, physical description, where and when purchased, and its purchase price or estimated value.



Want to discourage burglars? *(1) Keep windows closed and locked. (2) Use solid doors with good deadbolt locks. (3) Make full use of outside lighting. (4) Trim foliage away from windows and doorways. (5) Display "Operation I.D." or similar stickers. (6) Keep garage closed and locked. And remember to follow tips in "Vacation Protection Checklist" when away from home.*



Many communities are now sponsoring programs such as "Operation I.D." to help fight theft. Valuables are engraved or marked with the owner's driver's license number, and stickers are displayed to discourage burglars. Contact your police department to see if there's a similar program in your area.

Attach receipts, if you have them. *And take photographs of everything.* Then keep all this information in a safe deposit box at your bank. In case of a major loss, this should help you get a fast, fair settlement.

Q. What should I do if I see a burglary happening?

A. If you think there's a burglar in your neighbor's home, call the police immediately. Don't try to catch the suspect yourself.

But if you come face-to-face with a burglar in your own home, you should try to keep him from panicking and attacking you. Simply say, "Tell me what you want and I'll give it to you." Chances are he'll run out of the house. Or he might even take something. But anything material you lose is better than risking serious injury or losing your life.

After he's gone, call the police immediately. And don't tidy up. You may disturb some evidence the police could use.

Q. Won't all this security cost a lot?

A. It shouldn't. Most of the homes we inspected could be reasonably

Be alert for these suspicious signs

- A stranger entering your neighbor's house when the neighbor isn't home.
- Unusual noises, like a scream, breaking glass or explosion.
- People, male or female, in your neighborhood who don't live there.
- Someone going door-to-door in your neighborhood, if he tries to open the doors or goes into the backyard, especially if a companion waits out front or a car follows close behind.
- Someone trying to force entry into a home, even if he's wearing a repairman's uniform.
- A person running, especially if carrying something of value.

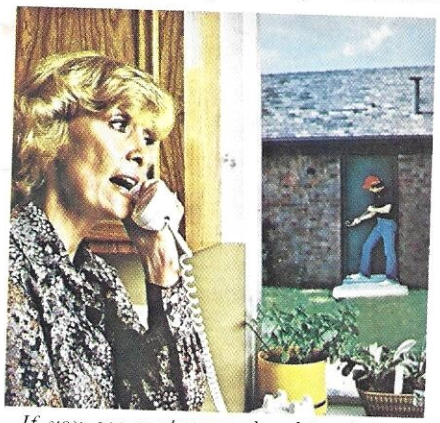
If you see anything suspicious, call the police immediately. Give them a physical description of the person and license plate number of the car. Even if nothing is wrong, they'll thank you for your alertness.

well secured for under $150. And there are several security measures you can take that will cost little or nothing:

(1) Keep a loud noisemaker at home: a police whistle, horn, or best of all, a barking dog.

(2) Most burglaries occur during the day, so ask neighbors who are home all day to watch your home. Better yet, invite the police to help organize your neighbors into a "neighborhood watch" program.

(3) Demand identification of any stranger at your door, no matter how "respectable" he looks. If he wants to use the phone, make the call for him. Burglars and rapists frequently pose as salesmen, repairmen, exterminators, inspectors, census takers, etc. If you're not *absolutely sure*, don't open the door.



If you see a stranger breaking into a neighbor's house, call the police. Don't try to catch the suspect yourself.

(4) Don't tell a caller that you are home alone.

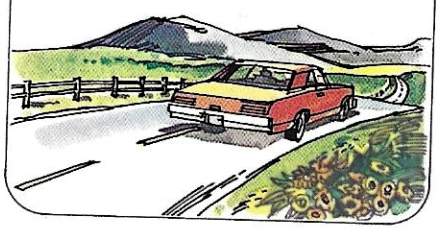
(5) Be discreet about the valuables you have at home.

(6) Don't publicize your vacations or

Vacation Protection Checklist

Anytime you'll be away from the house for several days or more:

- ☐ 1. Notify trusted neighbors that you'll be gone. Ask them to watch your house.
- ☐ 2. Have a friend mow your lawn.
- ☐ 3. Have post office hold your mail.
- ☐ 4. Stop newspaper delivery.
- ☐ 5. Ask a trusted neighbor to pick up anything that is delivered to your house.
- ☐ 6. Use timer switches or ask a neighbor to turn lights and radio on and off at appropriate times, day and night. Use photosensitive switches to turn outside lights on at sunset, off at dawn.
- ☐ 7. Notify police that you'll be out of town. They'll pay special attention to your home while they're on patrol.
- ☐ 8. Leave key with a trusted neighbor who can look inside your house daily, rearrange drapes or blinds, anything to give home lived-in look.
- ☐ 9. Remove anything of extreme value from house and put in safe place while you are gone.

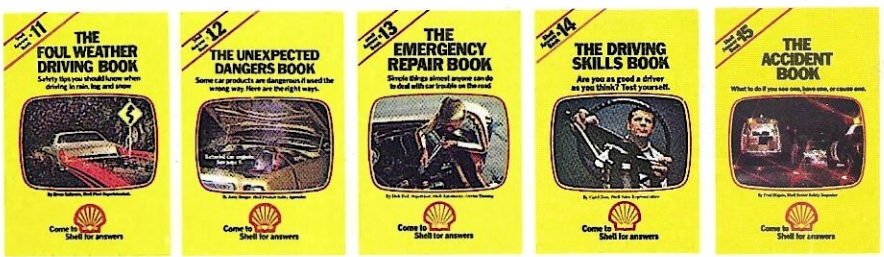


social events that will take you away from home. Burglars have even been known to watch obituaries and steal from the bereaved while they're at the funeral.

(7) Invite your local police to inspect your home for vulnerability. It's free. And the police would much rather prevent crimes than solve them.

Q. Any other questions?

A. If you have questions about this book, just write to me, Dick LaFaver, Shell Oil Company, P.O. Box 61609, Houston, Texas 77208.



How to get more answers from Shell. *Shell Answer Books are free at many Shell dealers. Or write Shell Answer Books, P.O. Box 61609, Houston, Texas 77208.*

Shell would like to thank the Houston Police Department, the Texas Department of Corrections, and the International Association of Chiefs of Police for their cooperation and generous assistance.

Come to Shell for answers

Shell Answer Book #17

THE SELF SERVICE BOOK

Why Self Serve should be more than just pumping your own gas

By Carroll Hansen, Shell Dealer

Come to Shell for answers

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Regular use of Self Serve *without* proper car maintenance may cost you more than you save. This book shows you how to do maintenance checks, as well as how to fill your own tank.

Every year more and more drivers discover Self Serve as a convenient and economical way to buy gasoline. And every year, it seems more cars pull into my station — or get towed in — needing costly repairs that probably could have been avoided. Personally, I think most drivers using Self Serve simply aren't taking the time to properly *maintain* their cars. They think they're saving money. But, by neglecting maintenance, they really aren't.

I stressed the safety aspects of Self Serve with the students. I warned them not to smoke in the station, and to watch out for hot engine parts.

Recently, I invited several students from a high school Driver's Education class to visit my station. First, I showed them how to use the gas pumps. Next, I pointed out the items they need to check periodically to help keep their cars in shape.

While showing this mother and daughter how to identify and check the windshield washer reservoir, I gave them a Self Serve courtesy tip: do the maintenance checks away from the gasoline island. That leaves room for other drivers to pull up and fill their tanks.

Then those same items were checked on 100 Self Serve customers' cars. The test results were disturbing, but not unexpected since they showed a general neglect of maintenance. Of the 100 cars:

- 56 were at least a quart low on oil
- 34 were low on radiator coolant
- 27 batteries were low on water
- 29 needed power steering fluid
- 28 needed brake fluid
- 33 had at least one tire well below recommended pressure levels.

In writing this book, I've included the information I gave to the students. It helped them realize the responsibilities of using Self Serve. And I hope it will help you, too.

Q. Won't I need a bunch of tools to do maintenance checks?

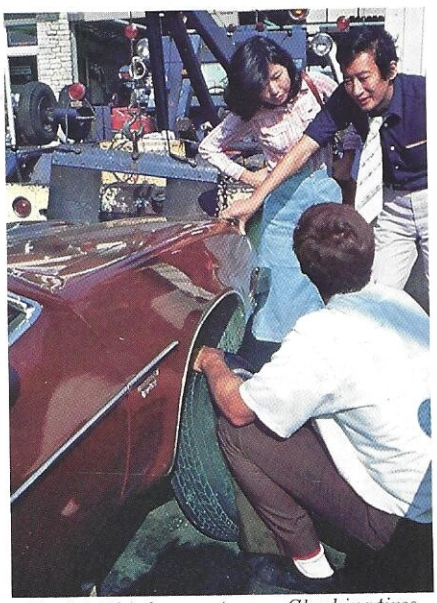
A. No. You only need a couple of things: (1) a rag or paper towel to check your oil and other fluid levels, and (2) a good tire gauge to check the air pressure in your tires.

Q. How often should I check my motor oil?

A. Every time you get gas. Just pull the dipstick out (careful: it could be hot), wipe it clean, put it back in until it won't go any farther, and pull it out again. The oil on the end of the dipstick should be between the "ADD" and "FULL" marks.

If it's at or below the "ADD" mark, you're probably a quart or more low. Add a quart. Wait a minute or so, then check the dipstick again. It takes a little time for the oil to show up on the dipstick once you've added some. Don't overfill!

Note: It's best to check your oil when the engine is cold or has had time to sit awhile. Fill your gas tank first, then check your oil. You'll get a more accurate reading. Remember, adding oil isn't enough. It should be changed periodically. Check your owner's manual to see how often.

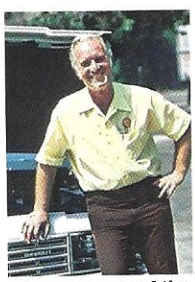


Don't let this happen to you. Checking tires on a regular basis might have saved this couple a towing charge, the cost of a new tire, and a lot of inconvenience.

Q. Do I have to take the radiator cap off to check the coolant level?

A. Not always. Many new cars have coolant overflow tanks, so you can visually check the level there. Check it about once a week.

If you have no overflow tank, don't remove the radiator cap when the engine is hot! The hot, pressurized coolant could spew out and scald you. (If the radiator is too hot to rest your hand on, it's too hot to open.) The best time to remove the



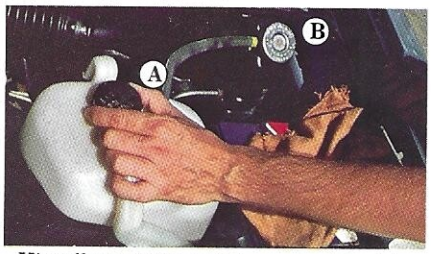
About the author

Carroll Hansen runs a Shell station in Los Angeles with Self Serve and Full Serve islands. He is also a Council Member of the Southern California Service Station Dealers Association. His knowledge of automobiles is matched only by his knowledge of football. Carroll played for Stanford in the 1951 Rose Bowl. He later graduated from UCLA with a degree in Business Administration. In the fall, he spends part of his spare time in the L.A. Coliseum as a spotter for UCLA football broadcasts. He has been an independent Shell dealer for fifteen years.

radiator cap is when the engine is cold. Then, in most cars, the coolant level should be about an inch below the bottom of the filler neck.

Note: Today's cars run hot. They need the cooling and anti-corrosion properties of a coolant/antifreeze solution. Water alone simply isn't enough to do the job.

Drain, flush, and refill your radiator every two years with a mixture of antifreeze and water, generally a 50-50 solution.



Visually check the radiator coolant level in the coolant overflow tank, if your car has one. You'll see two level marks – one for a hot engine, one for cold. If you need to add coolant, do it here (A), but not at the radiator cap (B).

Q. What about all those hoses?

A. Visually check the top and bottom radiator hoses for cracks, leaks, and bulges. Especially around the hose clamps. Do the same for heater hoses. Then squeeze the hoses when they're cool. They should be flexible, not stiff. It's good insurance to replace the hoses every two years.

Q. How can I be sure my tires have the right amount of pressure?

A. First, determine what the recommended pressure is. You'll find it printed on the sticker in your glove compartment, on your door jamb, or in your owner's manual.

Then, buy a good tire gauge and check the pressure in all your tires at least once a month.

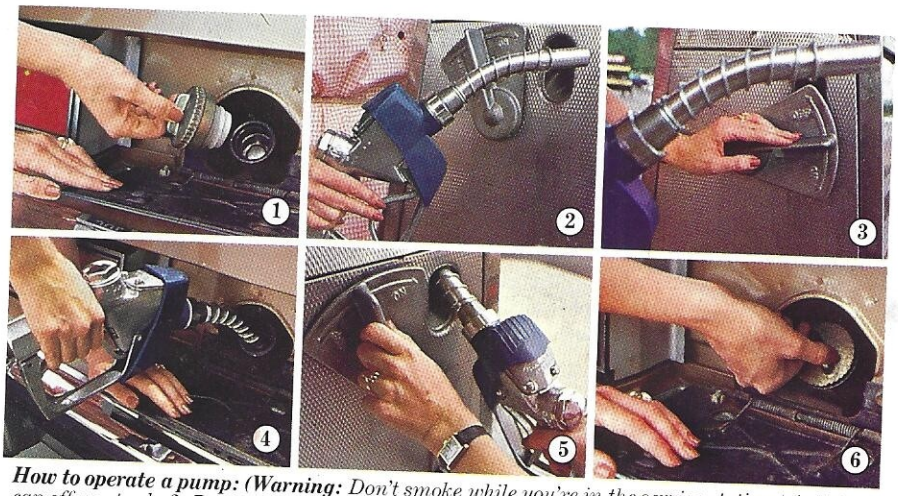
Note: The recommended tire pressure is for *cold* tires, when your car hasn't been driven for a few hours. That's why it's best to check the pressure *before* you start to drive. Or before you've driven more than a mile or so in the morning. (If you check your tires when they're hot, they'll be over the recommended pressure. But don't let any air out! The increase caused by heat is allowed for in the recommendations.)

For long trips, add two to four pounds over the recommended pressure. But *never* exceed the amount shown on the side of the tire.

Tire gauges vary in their size and accuracy. Be sure you get one that's well-made and easy to read.

When you check tire pressure, check tread wear, too. Worn-out edges can signal under-inflation. This decreases gas mileage and increases wear and the risk of a blowout. A worn-out center generally means over-inflation.

Visually check your tires every time you drive. Remember that a radial tire will bulge more than a non-radial. Replace any missing valve caps.



How to operate a pump: ***(Warning:*** *Don't smoke while you're in the service station.)* ***1.*** *Take cap off gas tank.* ***2.*** *Remove nozzle from pump.* ***3.*** *Turn pump handle to "on" position. (This should "clear" it, that is, change all numbers to zero. If it doesn't, call attendant.)* ***4.*** *Place nozzle in gas tank. Squeeze "trigger." (It's best not to squeeze "all the way." Gasoline will rush out too quickly and back-pressure in tank may cause trigger to click off too soon. Try to squeeze about "halfway.") When it does click off, take nozzle out of gas tank.* ***5.*** *Turn pump lever to "off" position and hang up nozzle.* ***6.*** *Put cap back on gas tank and pay attendant.*

Q. Which kind of gasoline should I pump into my car?

A. Today, there are basically two types of gasoline: unleaded and leaded. To tell if your car needs *unleaded*, look on your instrument panel or by the gas cap. You'll find a sticker that specifies "unleaded fuel only." *Leaded* fuel could hurt your car, and it's illegal to use. In fact, the nozzle from a leaded gasoline pump won't even fit in your gas tank!

If your car doesn't specify unleaded fuel, you can use *either* leaded or unleaded gasoline.

Here's another thing: Both unleaded and leaded gasolines have different octane ratings. And different cars have different octane "appetites." Some need less, some need more. If your car runs okay on a lower octane fuel, use it. It's usually

Check the Shell line for the right motor oil for your car

Shell Fire & Ice® 10W-40 is an all-season oil offering excellent high-temperature protection plus good low-temperature startability. Meets manufacturers' warranty requirements for automotive gasoline engines in all types of service.

Shell Fire & Ice® Super 10W-50 is the widest multigrade range you can buy; for even greater high-temperature protection than our 10W-40. Meets or exceeds manufacturers' warranty requirements for automotive gasoline engines in all types of service.

Shell X-100® is available in SAE 10W, 20W-20, 30 and 40 grades. Each meets the requirements of all automotive gasoline engines.

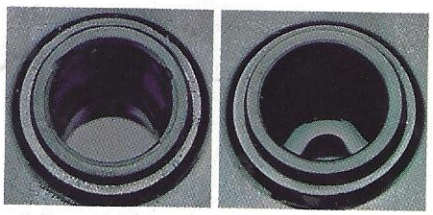
cheaper. But if your engine knocks, pings, or runs on, try a higher octane gasoline. If that doesn't solve your problem, you may need a tune-up.

Q. What am I looking for when I check my battery?

A. Every battery should have clean, uncorroded battery connections. If your battery is not maintenance free, look for a proper fluid level inside. If it is maintenance free, check your owner's specifications for details.

Make sure the battery cables are on tight and the ends aren't frayed. Corrosion will appear as a light-colored powder on the terminals that should be cleaned off with a paste of water and baking soda. Pour it directly on the corroded areas, wait a few minutes, and hose it off.

Caution: This chemical mixture will discolor a concrete driveway. Put a layer of newspapers down first.



Battery fluid level at left is low. Fluid surface is flat, doesn't reach the filler neck. Correct level at right touches filler neck and "puckers" a little.

To check the fluid level, take off the caps and look to see if the acid solution inside each cell comes up to the filler neck. When it's at the right level, the fluid *touches* the filler neck and "puckers" a little. If it's too low, add some water.

Warning: Don't smoke during this check. Batteries can give off explosive hydrogen.

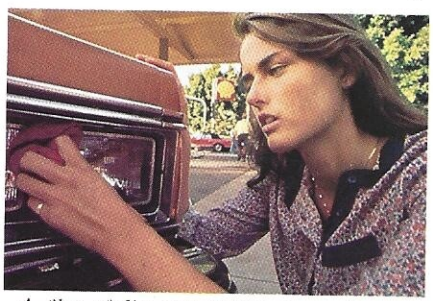
A clogged air filter can cut your gas mileage. Check it by holding the filter up to the sun. If you can't see light through it (left), replace it with a clean air filter (right).

Check the battery monthly in cold weather, weekly in hot weather, and daily on long trips.

Q. How do I check my automatic transmission and power steering fluids?

A. It's almost like checking your oil, because they all have dipsticks. I recommend you do the transmission check after you've driven about five miles. Do it *with the engine running*, the car in "Park," and on a level grade. In most cars, the transmission dipstick is on the passenger side, just behind the engine.

Warning: Avoid checking transmission fluid when transmission is likely



A film of dirt and grime can coat your headlights so that you may have trouble seeing at night. Take time to wipe them off, especially after driving on wet streets.

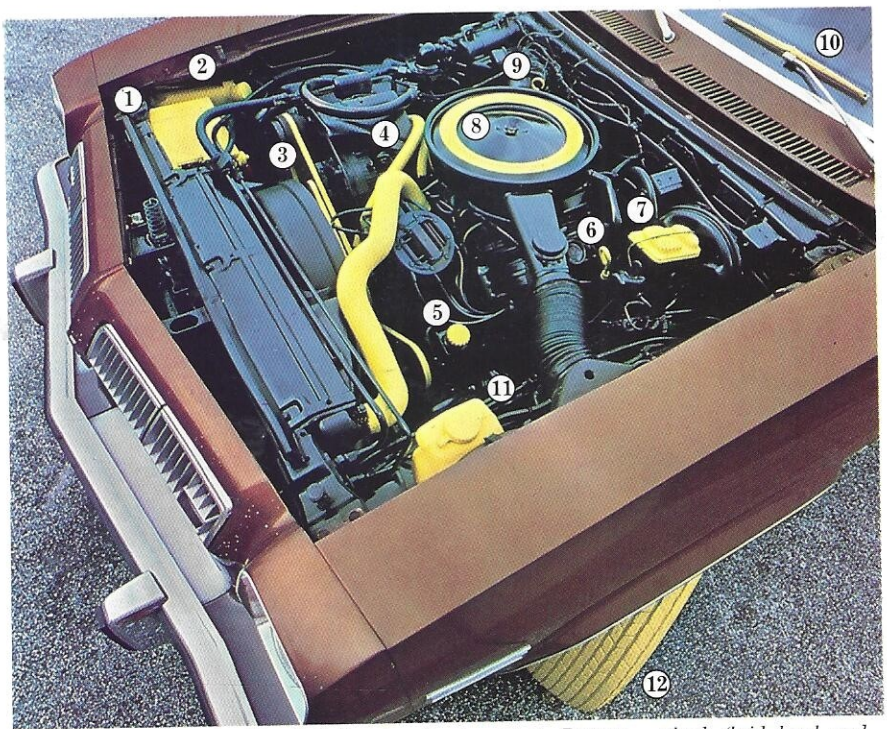
to be very hot, such as after a long, sustained drive.

Since the power steering dipstick is so close to the fan and belts, check it the same way, but *with the engine off*. Your owner's manual will tell you how often to do these checks and the recommended fluids to use.

Q. How can I tell if my brake fluid is low?

A. If you have to push the brake pedal almost to the floor to stop, chances are you're low on brake fluid. Some foreign cars have a see-through reservoir, so it's easy to check the level visually. On American cars, remove dirt from the lid and take it off. The brake fluid level should be within a quarter-of-an-inch of the top of both chambers.

If you need fluid, it's a good idea to ask your service station mechanic to add the approved type and check the system for possible leaks. Something serious could be wrong.



Maintenance Map for the Self Service Customer: ***1.*** *Battery – check fluid level and connections;* ***2.*** *Radiator coolant overflow tank – check fluid level for hot or cold engine;* ***3.*** *Belts – replace if badly cracked, frayed or chunked; check for proper tension;* ***4.*** *Hoses – flexible, not stiff; look for leaks;* ***5.*** *Power steering fluid – check level on dipstick;* ***6.*** *Motor oil dipstick – check oil level;* ***7.*** *Brake fluid – check fluid level in reservoir;* ***8.*** *Air filter – unscrew lid, lift out, check for clogging;* ***9.*** *Automatic transmission dipstick – check fluid level with engine running;* ***10.*** *Wiper blades – replace if brittle and cracked;* ***11.*** *Windshield washer reservoir – keep it full;* ***12.*** *Tires – check pressure and wear.*

Q. What's the fan belt test?

A. With the engine off, press your thumb down on the middle of each of the drive belts to check the tension. They shouldn't give more than about half an inch.

Look for fraying on belts, too. And don't forget to twist them around to check their undersides for deep cracking and chunking. Tighten or replace as necessary.

Q. If I know how to use Self Serve, why should I ever go to a Full Service station?

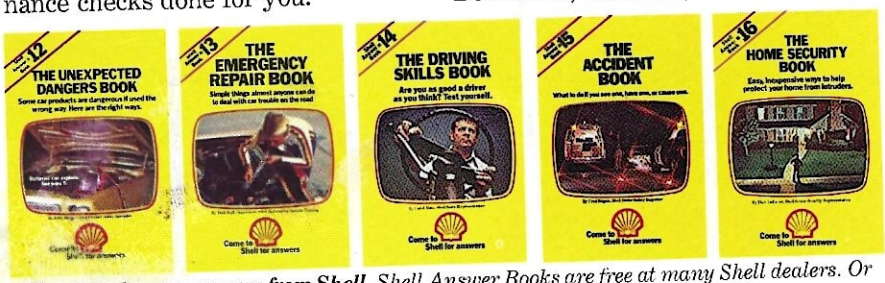
A. Because, one, if you're like some people, you may want these maintenance checks done for you.

Two, it's important to remember that there's more to keeping your car running its best than just performing these basic checks. Full Service generally means a station with a bay and lift, and a mechanic that can do air conditioning, tune-up, front-end alignment, and brake work.

And three, you may simply want the advice of a reliable mechanic, who can help you determine when to have this work done.

Q. Any questions?

A. If you have any questions about the information in this book, write us: Self Service, Shell Oil Company, P.O. Box 61609, Houston, Texas 77208.



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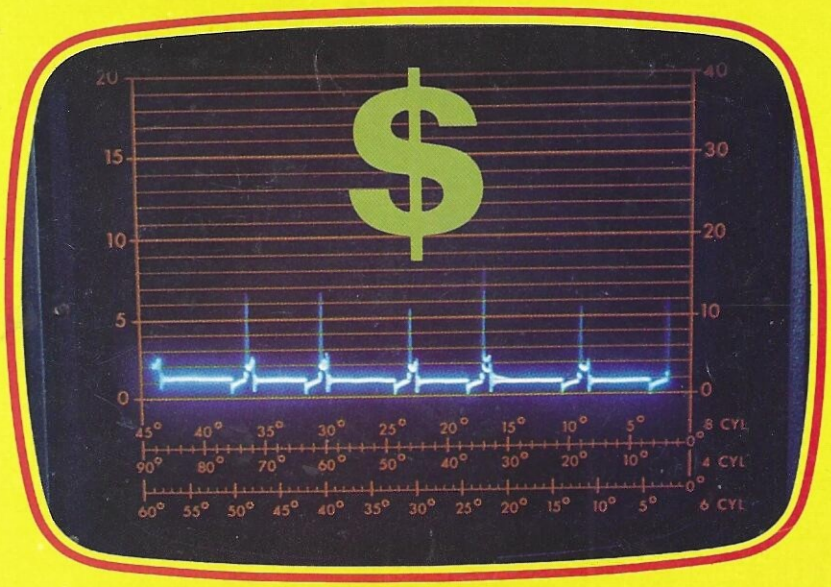
Come to Shell for answers

Shell Answer Book #18

THE TUNE-UP BOOK

What one is, what one does, and how to get the best value



By Ben Visser, Shell Automotive Expert

Come to Shell for answers

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Save this book. It can help you decide when your car needs a tune-up and help you shop for the best tune-up value.

Over the years I've been asked this question countless times: "Ben, my car's not running right; what's wrong with it?" Last fall, I participated in a unique Shell Tune-Up Clinic that answered that question for 116 drivers.

We first conducted a survey to find car owners who could say, "My car's not running right." Then we gave those cars a thorough 30-point checkup. We did everything from eyeballing the battery water to checking the emissions with infrared exhaust analyzers. Finally, we picked four cars that really needed some work, and we tuned them to see how much good a tune-up would do.

I used the results of our survey in preparing this book, which can help you understand your car a little better, and help you speak more knowledgeably to your mechanic.

How to take your car's pulse: *1. Keep an accurate record of gas mileage. A fall-off means a tune-up may be needed. 2. Be on the lookout for changes in the way your car runs. 3. Notice how frequently and under what conditions a problem occurs (engine hot or cold, etc.).*

About the author

Ben Visser is an automotive expert at Shell. He's in the Guinness Book of World Records as the world automobile mileage champion. In a car he helped build virtually from the ground up, he achieved 376.59 mpg in a Shell "Mileage Marathon."

Ben is a member of the Society of Automotive Engineers, and he's just as good with a wrench as he is with a calculator. He has designed courses on major engine tune-up for Shell instructors, and he is currently restoring a 1955 Thunderbird and a 1957 Chevy Nomad.

Q. How can I tell if my car needs a tune-up?

A. First, keep a running check on your gasoline mileage. (It's easy with the free mileage calculator pictured on page 5.) Figure your average mileage for every three tankfuls. When this average has dropped by over 15%, chances are you need a tune-up or other work.

Other symptoms of an out-of-tune engine are listed at right. Check each problem that occurs frequently with your car. The more problems you check, the more likely it is that your engine needs some sort of tune-up.

Our team of experts put 116 cars through a rigorous 30-point checkup. All the owners of these cars had complained of one or more problems (see checklist below), but 54 cars could have been fixed with only minor adjustments.

Check those problems that occur FREQUENTLY:

- ☐ Idles fast when warm
- ☐ Stalling
- ☐ Low power
- ☐ Idles rough
- ☐ Knocking or pinging
- ☐ Hard starting
- ☐ Misfiring
- ☐ Hesitation
- ☐ Rough running
- ☐ Engine runs on with key off
- ☐ Black exhaust smoke

Caution: Be especially aware of *changes* in your car's behavior. Look for things it's doing today that it hasn't been doing. Some models, for instance, will exhibit hard starting, knock or run-on, even when they're perfectly tuned.

Q. I checked several of those problems. Am I facing a big bill?

A. Not necessarily. For instance, of the 116 cars we checked, 54 needed only minor adjustments normally costing less than $10.

A common problem was idle speed. When it's too low, your car could stall out. When it's too high, your engine might continue to run on, even after the key is turned off. A mechanic can often adjust your idle speed quickly, using simple tools.

Incorrect ignition timing was found on many cars. Timing is often the culprit when you experience hard starting, pinging under acceleration

Using the oscilloscope, a skilled mechanic can check the condition of your points, plugs, plug wires, coil, condenser, distributor cap and rotor.

or loss of power. Like idle speed, ignition timing can be easily adjusted on most cars.

Ask your mechanic to check the engine before he replaces anything. If a few minor adjustments will do the trick, why should you pay for parts you don't need?

Q. So as long as my car runs fine, I can forget about tune-ups, right?

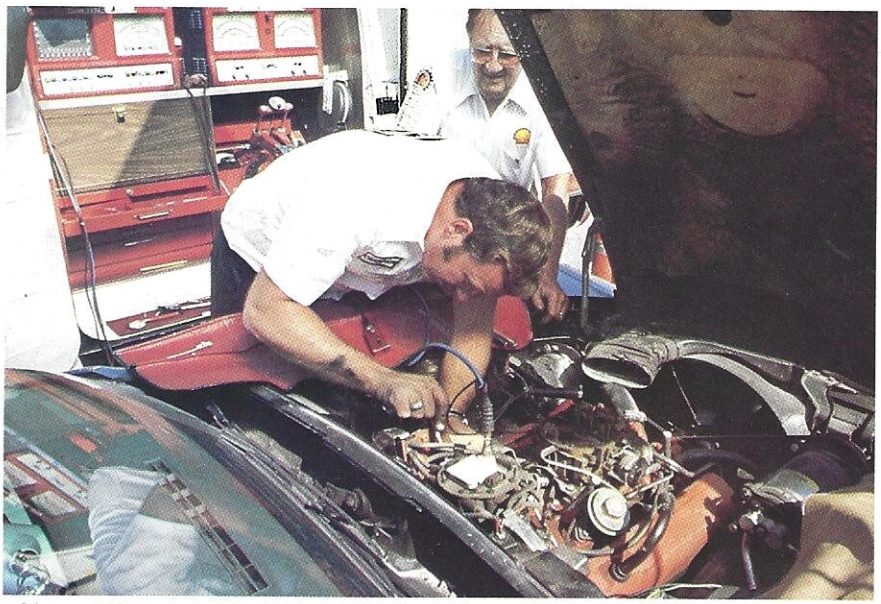
A. Wrong. Even if your car exhibits none of the symptoms discussed in this book, I recommend that you have it tuned periodically, as specified by the car maker.

As a rule of thumb, do it every 12 months or 12,000 miles if you use leaded gasoline, every 24 months or 24,000 miles with unleaded. It's a good investment in preventive maintenance that pays off in your having a reliable, smooth-running car.

Q. Isn't a tune-up just changing the points and plugs?

A. No.

A thorough tune-up is a four-step process, of which "changing the



Many of the cars we checked needed only a minor adjustment of idle speed or ignition timing. You might save money by having your car checked first, then authorizing only the work that needs doing.

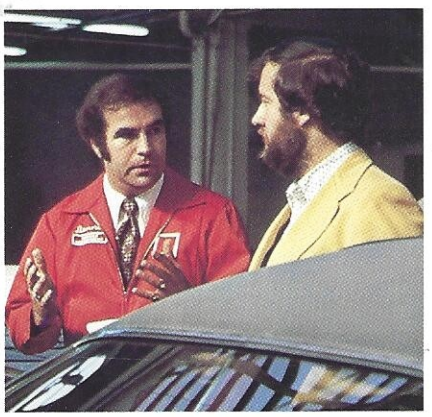
points and plugs" might be only one step. Here's what I think a tune-up should include:

1. Checking cylinder compression first, which determines whether a mechanical problem exists that a tune-up couldn't help. Then ignition, carburetion and pollution systems are checked against specifications (usually found on the underhood decal).

Engine idle speed, ignition timing, vacuum and mechanical advance, points and dwell, plugs, condenser, distributor cap and rotor, ignition coil, spark plug wires and PCV system should all be checked with engine-testing equipment.

Air and PCV filters, battery, automatic choke and vacuum hoses are checked visually.

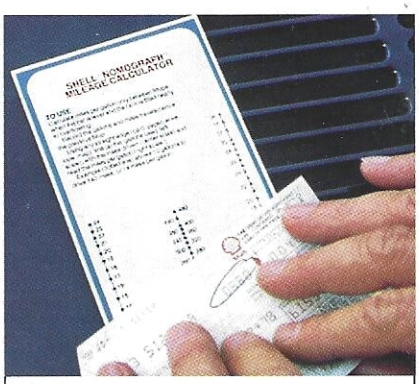
2. Replacing points, plugs, condenser, and those parts that cannot be brought up to specifications by cleaning and adjustment.



Shop around. That's what I did. I talked to a dozen service men in Nashville and found a wide variation in prices. Nationwide, the price of a thorough tune-up should average between $45 and $65 for a V-8 engine.

3. Adjusting slow and fast idle speeds, idle mixture, ignition timing, point dwell (or gap) and automatic choke. (NOTE: I always spray-clean the carburetor before making adjustments.)

4. Road-testing to make sure the car really runs as it should.



Get a free mileage calculator at participating Shell dealers

Gas mileage is one of the key indicators of your car's health. It's easy to keep an accurate running record of your gas mileage with this Shell Nomograph Mileage Calculator. On the back are spaces to figure miles driven and to record gallons needed to fill up. On the front, the nomograph lets you figure your miles per gallon using only a straightedge.

Q. What's all this going to cost me?

A. I asked a dozen service men in Nashville how much a tune-up would cost and what work would be done. (The car was a 1974 Ford LTD.) The lowest price was $29.50 and included only points, plugs and condenser. The highest was $75, and that included a complete diagnostic checkup, includ-

This 1973 Cadillac was delivering only 12.3 mpg at 55 miles per hour before we gave it a complete tune-up. After the tune-up, mileage increased to 15.3 mpg.

ing compression check, and all parts, even air and fuel filters.

Of course the price could vary widely, depending on where you live. My best guess for a national average would be somewhere between $45 and $65 for a thorough tune-up.

With the chassis dynamometer simulating road conditions, this 1970 Mustang cut its 35-55 mph acceleration time by 2.6 seconds after a good tune-up. On a two-lane road, a short passing time gives you a greater margin of safety.

Q. My gas mileage is lousy. Will a tune-up help?

A. Only if you've kept an accurate record of your gas mileage and have noticed a decline. (Remember what I said earlier about watching for a *change* in mileage.)

Some cars, especially 1973 and 1974 models, aren't going to get very good mileage, no matter how well they're tuned. And there are many factors that affect fuel economy. You might want to write for Shell Answer Book #3, The Gasoline Mileage Book, for more information. (See back cover for address.)

Q. Will a tune-up make my car peppier?

A. Usually. Providing you have no major mechanical problems (like burned valves), your car's performance depends heavily on how well it's tuned.

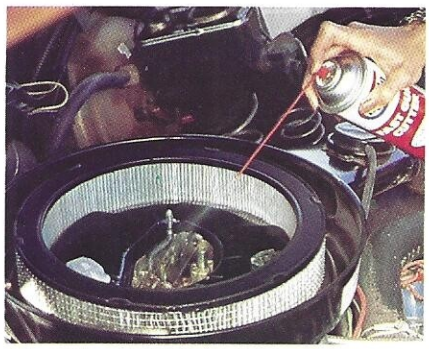
If your car has *become* sluggish (remember: look for a *change* in performance), a tune-up could give it more pep.

Sluggish performance can be dangerous. On the chassis dynamometer, we tested two cars under full-throttle acceleration from 35 to 55 mph. This is the situation you might face if you were passing someone on a two-lane road with oncoming traffic in the distance.

After getting a good tune-up, both cars cut their acceleration times by at least 1.2 seconds. That kind of performance boost could give you a greater margin of safety in a passing situation.

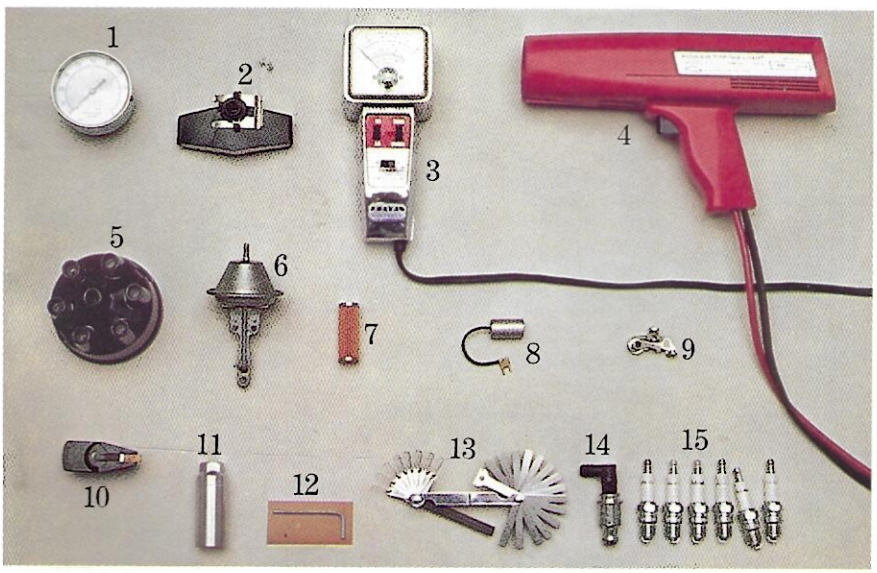
Q. Can I do it myself?

A. Maybe you can. A recent survey showed that over one-third of all tune-ups are now being performed by do-it-yourselfers.



A sticking choke or dirty carburetor can cause hard starting, rough running, stalling and poor fuel economy. Carburetor cleaning sprays may solve the problem, and they're easy to use. Just follow the directions on the can.

Here's a little self-test: See if you can name the tools and parts in this picture. If you can, and you have a little mechanical aptitude and the ability to follow directions, chances



If you know what these tools are and how to use them, and can identify the parts most commonly used, you might be able to do your own tune-ups. Answers on back cover.

are very good that you could do your own tune-ups.

You'll need most of the tools shown and a repair manual for your car. Use the manufacturer's specifications for your engine, usually shown on a decal found in the engine compartment.

Q. What if I have some more questions?

A. Write me. I'll be happy to answer tune-up related questions to the best of my ability. Write to me at this address: Ben Visser, Shell Oil Company, P.O. Box 61609, Houston, Texas 77208.

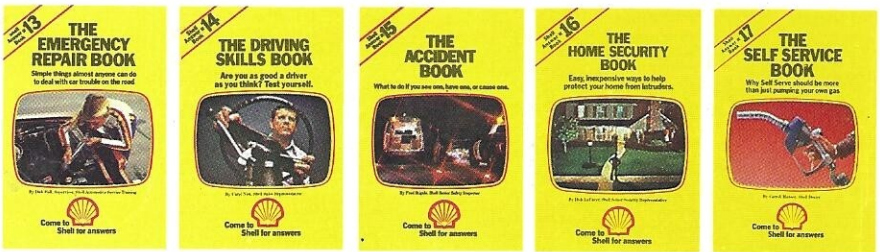
Note to owners of fuel-injected cars

While your ignition is tuned like any other, fuel injector adjustments should be done by trained specialists.

There is one thing you need to watch closely, and that's your fuel filter. Fuel-injected engines are more sensitive to dirt than carbureted engines.

Make sure you always have your fuel filter replaced on schedule. If you do it yourself, be careful not to get any dirt in the injector side of the fuel line.

Answers: (1) Compression tester (2) PCV air filter (3) Dwell/tachometer (4) Timing light (5) Distributor cap (6) Vacuum advance unit (7) Fuel filter (8) Condenser (9) Breaker points (10) Distributor rotor (11) Spark plug socket (12) Allen wrench (13) Feeler gauge (14) PCV valve (15) Spark plugs.


No. 13
THE EMERGENCY REPAIR BOOK
Simple things almost anyone can do to deal with car trouble on the road.
Come to Shell for answers
No. 14
THE DRIVING SKILLS BOOK
Are you as good a driver as you think? Test yourself.
Come to Shell for answers
No. 15
THE ACCIDENT BOOK
What to do if you see one, have one, or cause one.
Come to Shell for answers
No. 16
THE HOME SECURITY BOOK
Easy, inexpensive ways to help protect your home from intruders.
Come to Shell for answers
No. 17
THE SELF SERVICE BOOK
Why Self Serve should be more than just pumping your own gas.
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How to get more answers from Shell. *These and other Shell Answer Books are available at many Shell dealers. Or you can write Shell Answer Books, P.O. Box 61609, Houston, Texas 77208.*

Come to Shell for answers

Shell Answer Book #22

THE HOME ENERGY-SAVING BOOK

Some simple ways to help you save up to 50% on home energy.

Tear out and save

By Sheldon Lambert, Shell Manager of Energy Economics

Come to Shell for answers

Follow the steps in this book. Then keep it handy as an energy-saving reminder.

© 1980 Shell Oil Company

Good news! You don't always have to sacrifice comfort or convenience to conserve energy. And you don't have to *spend* a lot of money before you start *saving* money.

Some of the conservation measures in this book are absolutely free and can start saving you money today. Some others should pay for themselves with the energy and money they save.

In Washington, D.C., I met with Jim Tanck, Director of the Residential Conservation Branch of the U.S. Department of Energy. He told me about various government grants and tax credits available to people who improve their home energy efficiency.

I learned about many of these methods by visiting with Dr. Arthur H. Rosenfeld at the Lawrence Berkeley Laboratory in Berkeley, California. Their Energy-Efficient Buildings Program is one of the tops in the nation.

I also talked with officials on national and local levels to learn what's being done to encourage conservation in the home.

My findings are in this guide.

How much *you* can save depends on where and *how* you live. An energy audit can give specific tips for you and your home. Some utility companies already offer home energy audits and, by law, they'll all have to do so by the fall of 1980.

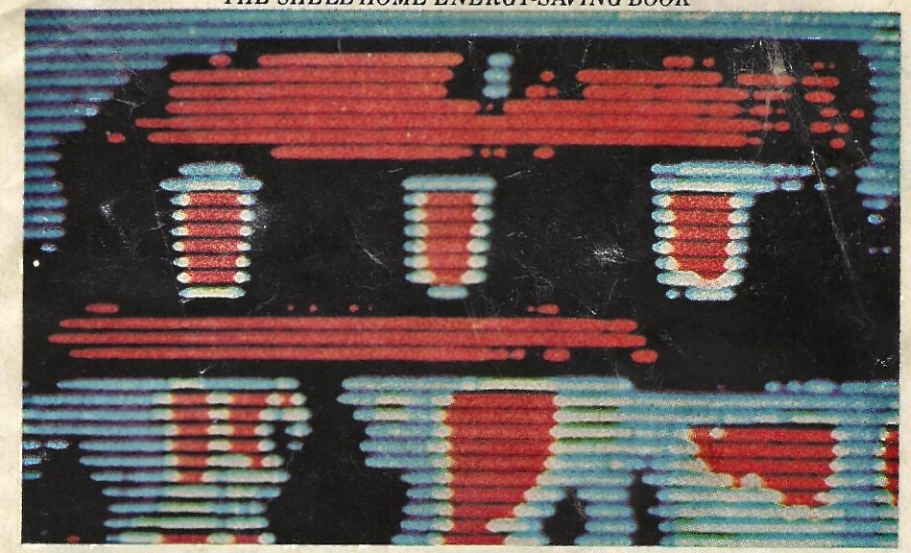
Q. What's the biggest energy waster in my home?

A. Your home, itself.
About ⅔ of the energy used in most homes is for heating and cooling. But hundreds of your heating and cooling dollars may be leaking out through windows, doors, tiny cracks and holes, and poorly insulated ceilings, walls and floors.

Q. Cracks and holes! In my home?

A. In every home.
For every electrical outlet, plumbing pipe and fireplace, you'll find a hole.

And where two surfaces join together, you'll often find a crack.



The red areas in this infrared photograph show where poorly insulated and sealed homes leak energy the most: around windows, doors and roof. (Photo courtesy of Owens-Corning Fiberglas Corp.)

Cracks can often develop where the door meets the frame, or the frame meets the wall. Many times, you'll find cracks around floorboards and staircases. And many of your heating and cooling dollars could be leaking out through these places.

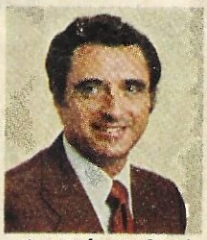
Many small leaks can add up to big losses. You need to find them and plug them up.

Q. If I can't see leaks, how can I find them?

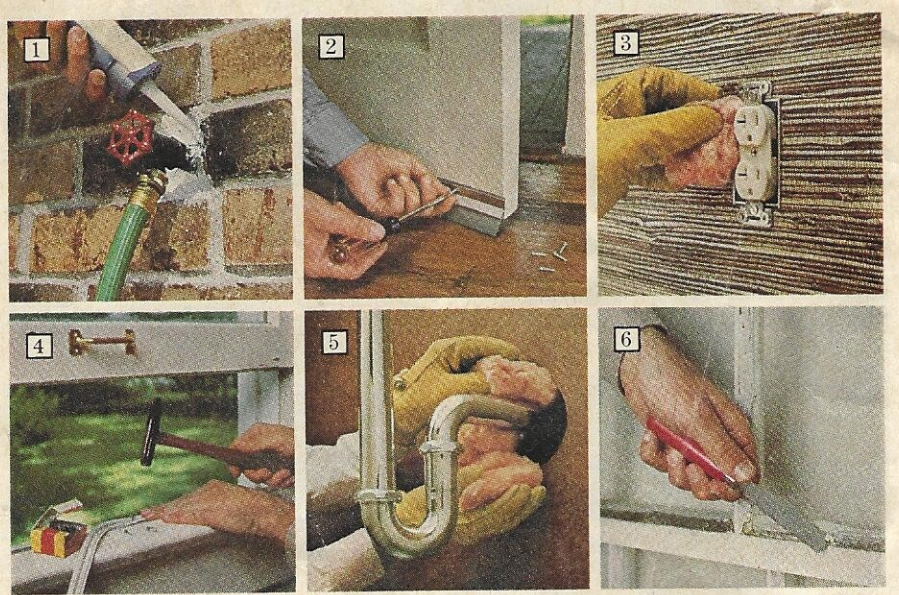
A. You can feel many of them. On a cold, windy day, run your hand along the edges of windows, exterior

This photograph shows how air leaks around a window without weatherstripping. If your windows leak, add weatherstripping. And caulk any cracks where the frame meets the wall.

About the author



Shel Lambert is Shell's Manager of Energy Economics–Corporate Planning. He joined the company in 1958 after receiving his Ph.D. in physical chemistry from Ohio State University. His corporate and academic accomplishments are many, including 30 technical papers, contributions to textbooks, and serving on numerous national committees and task forces.



1. Caulk around outdoor faucets. 2. Weatherstrip doors. 3. Pack fiberglass insulation between wall and electrical outlet box. 4. Weatherstrip windows. 5. Insulate holes around pipes and wires. 6. Replace worn-out caulking and weatherstripping.

doors and baseboards. Where there's a leak, you'll feel a cold draft.

If you follow the checklist on page 7, you should be able to make your house reasonably weathertight, for very little money.

Eliminating drafts and cold spots should help make your home more comfortable, too. Then your home can *stay* warmer in winter and cooler in summer, while you spend less on heating and cooling.

Q. I sealed my windows. Why are they still cold?

A. Sometimes sealing cracks around windows isn't enough. The glass itself can steal heat from your home in winter months, and let the sun's heat in during the summer months.

You can cut this heat loss in half by adding storm windows or double-glass windows. And here's a money saver that's free:

On winter days, pull the draperies back from windows facing the sun to let the warmth in. (This is "passive solar heating.") At night, cover all windows to keep the heat in.

On summer days, keep the draperies closed to keep the heat out. (Light-colored draperies or shades reflect the sun best.)

Q. Which is more important: fixing leaks or adding insulation?

A. They're both important, because they work together. Insulation is much more effective in a home that is weathertight.

Most homes need good attic insu-

lation. Without it, the attic will add heat to your home in summer, and let heat escape in winter.

Heat is also transferred through the walls. And through floors over unheated spaces like garages and crawl spaces. If you have especially harsh winters or summers, you may find it worthwhile to add wall and floor insulation.

You may be able to install attic and floor insulation yourself. But adding wall insulation to an existing home is tricky. It takes special equipment. Be sure you choose a reputable firm.

How to make your water heater a money saver.

Water heaters burn about 15% to 20% of your home energy dollars. To help use less, try a lower thermostat setting. If yours is set for 140°F, 110°F may be sufficient. If it doesn't show degrees, just turn it down some. Wait a few hours, then check the temperature by holding a thermometer under the tap when the water's hottest.

Touch your water heater. If you feel any heat, you're losing energy. Insulation helps. Kits cost about $10-$20 at hardware and plumbing supply stores. If you insulate and lower the thermostat, you can cut your water heating bills by about 20%.

Q. Do all energy-saving measures cost a lot in time and money?

A. Absolutely not.

Here's a list of extra easy, extra cheap things you can do to save on energy. Some are absolutely free.

Gas furnace pilot light. Turn it off in spring and back on in fall. (Be *sure* you know how, or ask your utility company.)

Shower flow limiter. This helps you save on water and water heating, too. Add a simple washer to your shower head (ask your hardware man to help) or buy a shower head designed to limit flow while still giving a comfortable shower.

Cold water wash. Some laundry detergents are effective in cold water. A big hot water saver.

Fans & space heaters can keep individual rooms comfortable for much less than it costs to heat or cool the whole house.

Thermostat setting makes a difference, too. Adjust the thermostat so the system won't work as hard when you're away from home. Do the same when you go to bed.

Electric blanket lets you sleep comfortably warm while house is cool. Much cheaper than heating your house, or even your room.

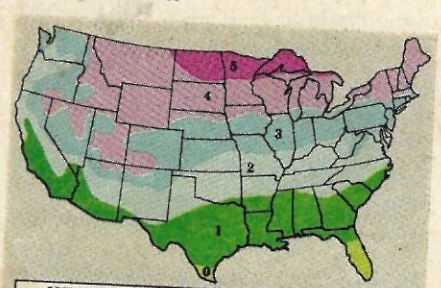
Small appliances in the kitchen

can be big money savers. Electric skillets, toaster ovens, automatic coffee makers, microwave ovens, and slow cookers all might well do the job while using less energy than a conventional electrical oven and range.

Common sense. Dress for the season, even indoors. Keep windows and doors shut while using air conditioner or heater. Step quickly through doors to reduce air loss. Close off doors and air ducts to unused rooms.

Q. How much insulation is enough?

A. It depends on the weather where you live. The map on this page, provided by the National Solar Heating and Cooling Information Center, gives minimum recommended "R-values" for attic, wall and floor insulation in different parts of the country. R-value is a measure of insulation's resistance to heat transfer. The higher the R-value, the better the insulation.



HEATING ZONE	RECOMMENDED FOR CEILING	WALL	FLOOR
0, 1	R-26	R-13	R-11
2	R-26	R-19	R-13
3	R-30	R-19	R-19
4	R-33	R-19	R-22
5	R-38	R-19	R-22

Sources for R-value data above include Federal Housing Administration, American Society of Heating, Refrigeration and Air Conditioning Engineers and insulation manufacturers.

Dr. Rosenfeld showed me one of the new fluorescent lights designed to fit ordinary light bulb sockets. Fluorescent bulbs give just as much light for less than half the energy of incandescent bulbs. And they last much longer.

Q. Can different appliances really make a difference in saving energy?

A. Definitely.

For example, take two comparable refrigerators. One might cost 50% more to use than the other.

And there is governmental help on the way, too. In an effort to help you shop even more wisely, the Federal Trade Commission is planning new requirements for several major home appliances.

Manufacturers would have to label their products with cost or energy-efficiency data, giving comparisons with similar products.

How to save up to 40% on your heating and cooling bills.

About ⅔ of your home energy dollars go for heating and cooling. But if your home isn't weathertight, you could be wasting up to 40% of your money.

You can probably plug up most leaks with materials you can buy at your local hardware store. Ask your salesperson how much to buy.

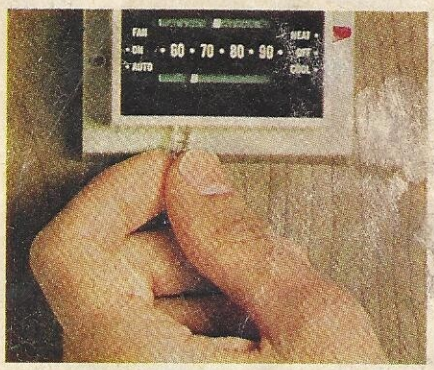
Caulk. Buy this soft, putty-like substance in "cartridges" and squirt it into cracks with a "gun." (I recommend an acrylic *latex* caulk.) Cost: for average home, about $10 to $17.

Oakum caulk rope. To seal larger cracks, pull off pieces of rope and stuff into opening. Cost: about $.70 to $1.30 per pound.

Weatherstripping. Strips of metal, rubber, foam, or felt which you tack or glue around doors and windows. Different kinds for different uses. Ask your hardware man for his recommendations. Cost: about $2 to $8 for each window, $4 to $10 for each door.

Use this list to help find leaks and fix them.

- **Windows and doors.** When they're closed, can you see cracks around the edges or feel a draft? If so, add weatherstripping. Caulk any cracks where frame meets wall.
- **Pipes, ducts and wires.** Check holes cut for these in floor, exterior walls and ceiling. Seal any openings with caulk or fiberglass insulation. (Wear gloves when handling fiberglass.) Insulate ducts and heating pipes in unheated spaces.
- **Electrical outlets** and light switches on exterior walls. Cut off electricity. Then remove cover plate and pack fiberglass insulation between outlet box and wall.
- **Foundation seal.** Check for cracks along outside wall between concrete foundation and house. Stuff with oakum caulking rope, caulk over it.
- **Mail chute** in door or wall. Does it close tightly? Oil hinges.
- **Fireplace.** Close damper tightly when not in use. If no damper, cover opening with wood. Caulk cracks where fireplace meets wall.
- **Exhaust fans** in bathroom and kitchen. Use as little as possible. Keep filters clean. Remove covers and caulk any major cracks around fan.
- **Attic door.** Be sure door fits tightly. Weatherstrip where needed.
- **Basement door.** Keep it closed. Weatherstrip for tight fit.
- **Garage door.** If garage is attached to house, weatherstrip garage door and door between garage and house.
- **Broken siding or shingles.** Replace them. Or to close small cracks, tack or glue loose pieces back in place.
- **Masonry cracks.** Caulk any deep cracks in exterior walls.
- **Old caulk and weatherstripping.** If torn, bent, or chipped, remove and replace.



A no-cost way to hold down heating and cooling bills is to adjust your thermostat. It is estimated that you can save 1% to 2% on your heating bill for every degree you lower your thermostat in winter. In summer, keep the thermostat at 78° to save up to 30% on cooling costs, depending on regional location.

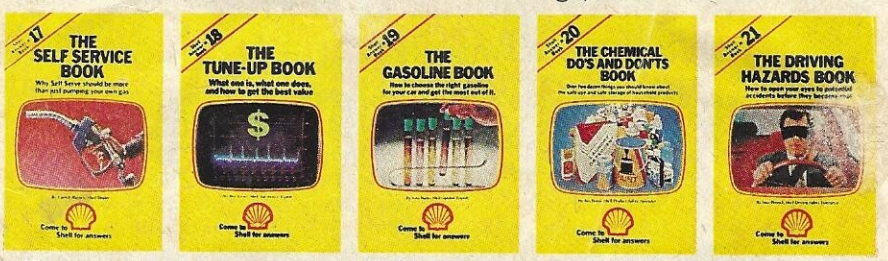
Q. How can I save when washing and drying clothes?

A. One way is to do fewer full loads rather than a lot of half-full loads. And consider this. Every time you use a clothesline instead of a dryer you save money, too.

Q. Any questions?

A. If you have any questions about the information in this book, write to me, Sheldon Lambert, P.O. Box 61609, Houston, Texas 77208.

And for more information, contact your local utilities. Or write to Technical Information Center, Department of Energy, Box 62, Oak Ridge, Tennessee 37830.



How to get more answers from Shell. *These and other Shell Answer Books are available at participating Shell dealers. Or you can write Shell Answer Books, P.O. Box 61609, Houston, Texas 77208.*

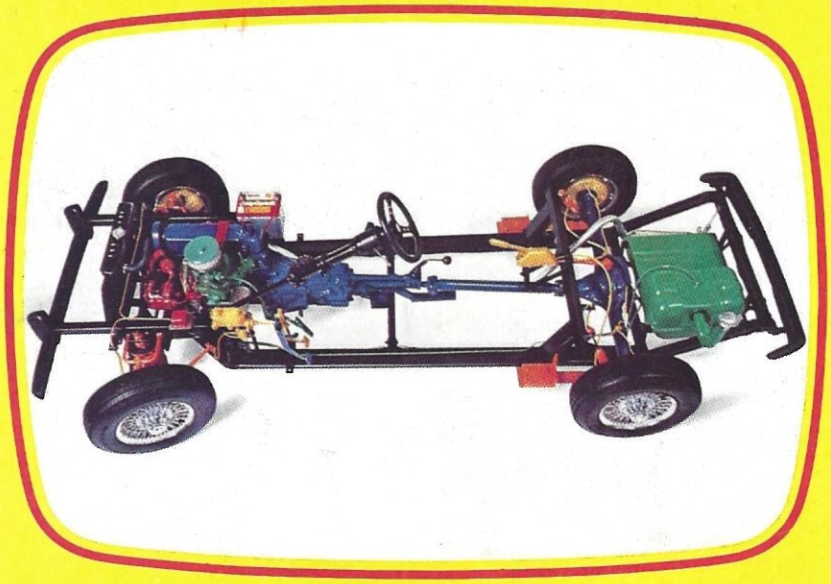
Come to Shell for answers

S8

Shell Answer # Book 23

THE HOW YOUR CAR WORKS BOOK

A guide to the understanding and care of your car



by Howard Schmitz, Shell Automotive Expert

Come to Shell for answers

Understanding how your car works can help you keep it working better

©1980, Shell Oil Company

This book won't turn you into a mechanic, but it will help you understand your car and why it's important that you follow the maintenance schedules in your owner's manual. It can help you spot problems in advance and talk more knowledgeably with your mechanic.

To illustrate the inner workings of a car for you, we built a small car. We took photographs along the way, to give you an inside look at what makes a car work.

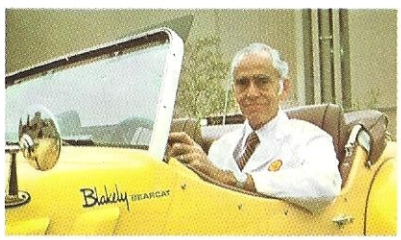
Q. What happens when I turn the key?

A. When you turn the key to start the engine, two things happen:

1. Cranking — The starter motor cranks the engine, moving the pistons inside the cylinders. The motion of the pistons sucks a mixture of air and gasoline into the engine.

2. Ignition — The ignition system puts a spark to this mixture, and the engine starts running.

These are the things that are *supposed* to happen when you turn the key. Help make sure they *do* happen by always keeping enough water in your battery and by keeping the battery connections clean and tight.



About the author

Howard E. Schmitz is a chemical engineer. For most of his 38 years with Shell, he worked on research and development of industrial lubricants and engine oils. Now, as a consultant to the advertising department, Howard is primarily responsible for the technical accuracy of statements and claims made in Shell advertising.

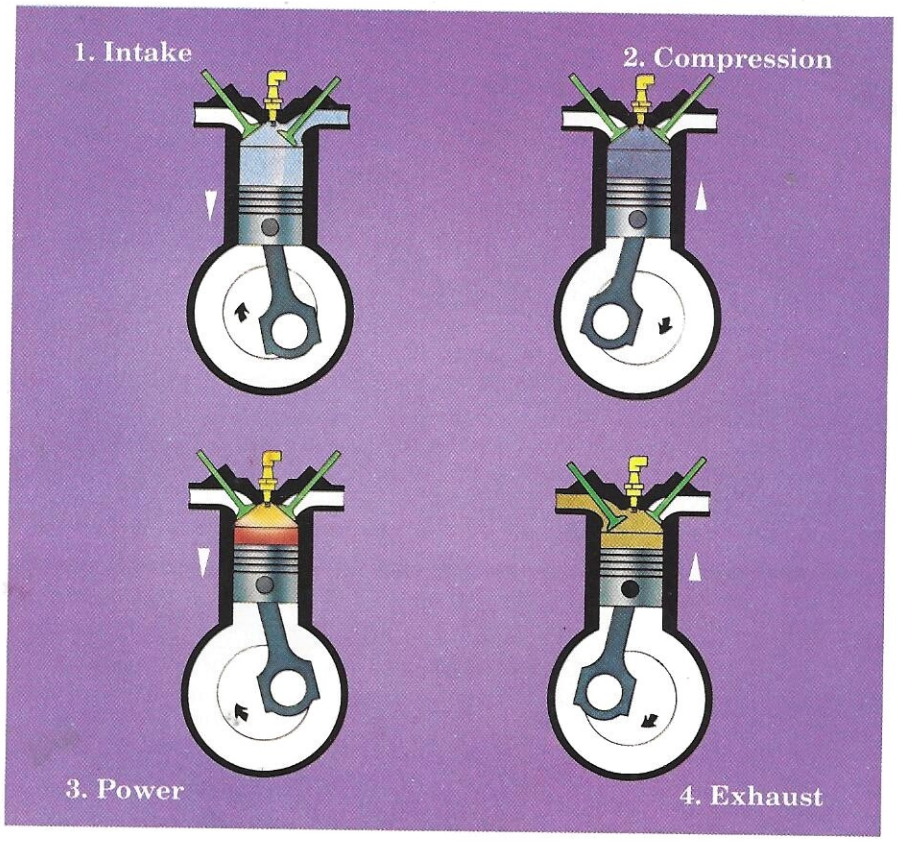
Q. How does the fuel reach the cylinders?

A. The fuel pump draws gasoline from the tank, through the fuel line. The fuel goes through a filter to remove any dirt and rust; then it goes to the carburetor (or fuel injectors).

The carburetor mixes the correct amount of gasoline with the air being drawn into the cylinders. When you step on the gas pedal, the carburetor throttle opens to let more air/fuel mixture into the engine.

If too much gasoline enters the cylinders during cranking, the engine is "flooded." Holding the gas pedal down will help start it.

NOTE: A clogged air filter robs power and wastes gas. A dirty fuel filter can cause hard starting and rough running. Change filters as recommended by your owner's manual.



Q. What powers the pistons?

A. Explosions in the cylinders. Here's how it works:

1. Intake—The camshaft opens the intake valve. As the piston moves down, the fuel/air mixture (blue) is drawn into the cylinder through the valve.

2. Compression—As the piston moves back up, the intake valve closes and the fuel/air mixture is compressed into a small volume around the spark plug.

3. Power—The spark plug sparks, igniting the mixture. This explosion (red) forces the piston back down. Piston rings form a seal to prevent leakage of expanding gases.

4. Exhaust—The camshaft now opens the exhaust valve. The piston moves up, forcing the waste products from the explosion out through the muffler and tail pipe.

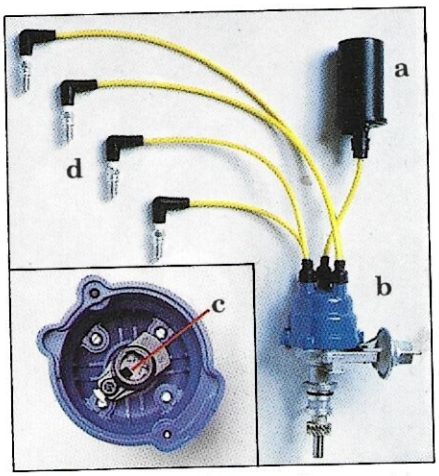
A weak spark will sometimes fail to ignite the mixture. This causes "missing," loss of power, poor fuel economy and excessive pollution. Missing can cause a popping noise in the exhaust. These are indications that you need a tune-up.

Q. What makes the spark plugs spark?

A. Electricity from the battery. Your battery provides 12-volt electricity, but spark plugs need over 20,000 volts. So a "coil" boosts the voltage.

Then the electricity is sent to the distributor which acts like a card dealer, passing out current to each of the spark plugs at exactly the right moment. (See inset, right.)

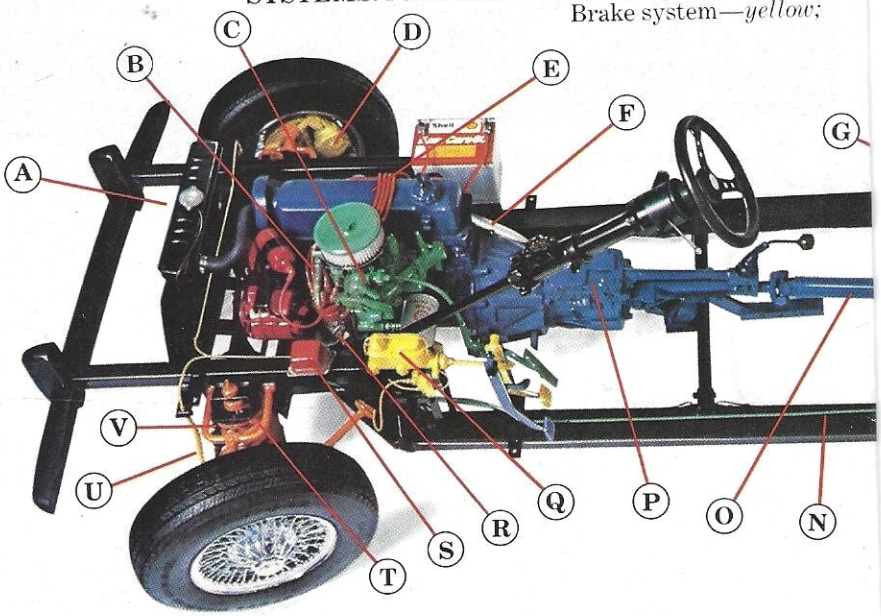
If you hear a metallic rattling noise ("knock" or "ping") as you accelerate, your plugs may be firing too soon. Sluggish performance and poor fuel economy could mean they're firing too late. Have the timing checked if you notice these symptoms.



***Coil** (a) boosts voltage, sends current to **distributor** (b). **Rotor** (c, inset) sends current to **spark plugs** (d) in turn.*

THE ANATO

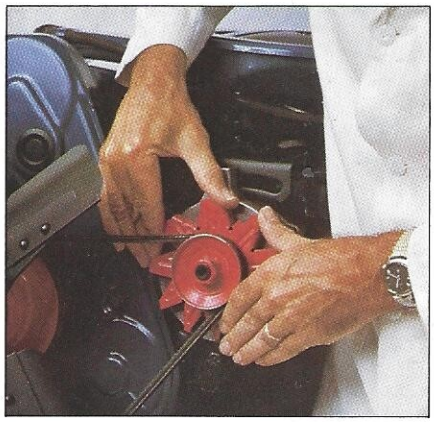
SYSTEMS: Power train—*blue;* Fuel system—*green;* Brake system—*yellow;*



Q. Why don't the spark plugs drain the battery?

A. While the engine is running, the battery is constantly recharged by the alternator, which is driven by a fan belt. To make sure the battery isn't damaged by overcharging, the voltage regulator monitors and adjusts the alternator's output.

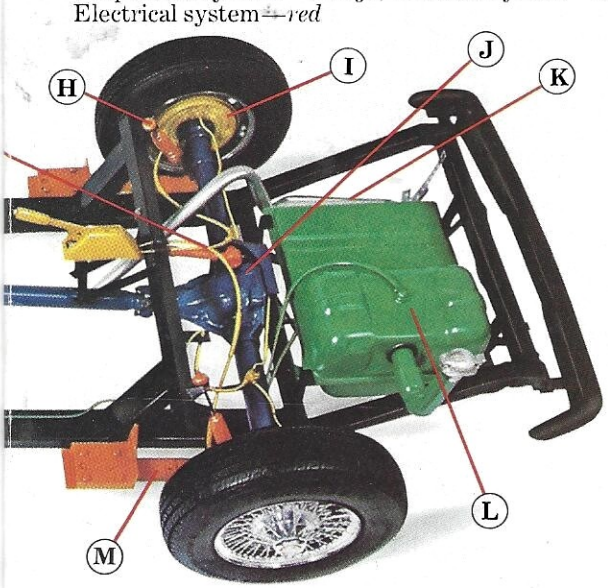
If your ALT or GEN light stays on while you are driving, something is wrong with the charging system. It could be a bad alternator, a loose or broken belt, a faulty voltage regulator, perhaps a loose or disconnected wire. Have it checked out before a dead battery leaves you stranded in the middle of nowhere.



To help avoid a dead battery, check the alternator belt every month or two. If it's loose enough that you can turn the pulley by hand, have it tightened. If it looks worn or frayed, have it replaced.

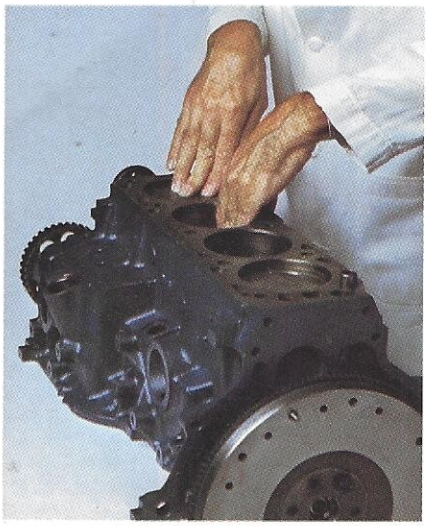
MY OF A CAR

Suspension system—*orange;* Exhaust system—*silver;* Electrical system—*red*



COMPONENTS:

(A) radiator
(B) fuel filter
(C) carburetor
(D) front disc brake
(E) engine
(F) exhaust pipe
(G) parking brake cable
(H) shock absorber
(I) rear drum brake
(J) differential
(K) muffler
(L) fuel tank
(M) rear leaf spring
(N) fuel line
(O) drive shaft
(P) transmission
(Q) master cylinder
(R) fuel pump
(S) voltage regulator
(T) upper control arm
(U) brake lines
(V) front coil spring



As I push the pistons up and down inside the cylinders, the crankshaft turns. It's like pedaling a bicycle. Your legs go up and down, and the pedals go around.

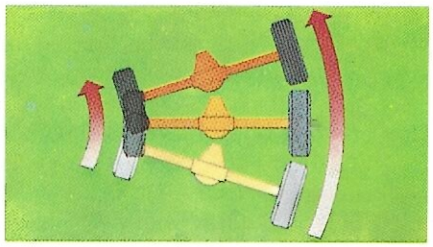
Q. Why does the transmission have different gears?

A. The faster the engine turns, the more power it can make. The lower gears let the engine turn faster for the extra power needed to accelerate from a stop or climb a steep hill. High gear lets the engine slow down a bit for longer life and better fuel economy, while giving enough power for highway speeds. If you have an automatic transmission, check the fluid level every six months.

Q. What in the world does the differential do?

A. As you go around a curve, the differential lets the outside wheel turn faster than the inside wheel, because the outside wheel has farther to go.

But the differential won't drive both wheels if one slips. If you're stuck, put something under that tire for traction, or gently apply the parking brake and gas at the same time.



When you turn, the differential lets the outside wheel turn faster, because it has farther to go.

***Disc** brakes "grab" the disc to slow the car, as I'm demonstrating here. **Drum** brakes have **shoes** that press against the inside of a round drum.*

Q. How do the brakes work?

A. When you step on the brake pedal, you send hydraulic fluid through pencil-thin brake lines to the wheels. The pressure of the fluid forces the brake shoes against the rear wheel drums and the disc pads against the front wheel discs. This friction slows the car.

Eventually the friction will wear

down the brake shoes and pads, and they will have to be replaced. If you hear funny noises when you put on the brakes, like high-pitched squeals, grinding or clicking, please have your brakes checked.

If your "BRAKE" warning light comes on when you apply the brakes, you might be low on fluid, or you might have air bubbles in your brake lines or worn hydraulic cylinders. Have it checked out. Brakes can be a matter of life or death.

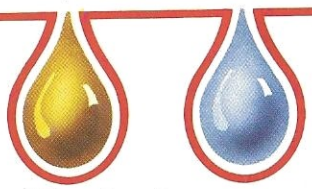
With the front wheels straight ahead, see how far you can turn the steering wheel without moving the front wheel. If there's more than two inches of free play, have your steering checked. (With power steering, engine should be on.)

Q. How does the steering wheel turn the wheels?

A. When you turn the steering wheel, it turns gears inside the steering gearbox. The steering gears move rods connected to the front wheels.

With power steering, turning the wheel directs high-pressure fluid to a hydraulic cylinder, which reduces the amount of effort needed to turn the wheels. If you have power steering, check the fluid level regularly.

Have your front wheel alignment checked once a year. Proper alignment can prolong tire tread life and make your car safer.



Oil and water—your car can't live without them

The right kind of oil does many things for your engine. It cuts friction to protect moving parts. It forms a seal between the piston rings and cylinder walls. It helps reduce engine heat and prevent rust. High-grade detergent oil also helps keep the engine free of damaging sludge and lacquer.

Check your oil every time you fill up, and *change* the oil and filter according to your owner's manual. Use a grade and type of oil recommended by your manufacturer.

Water carries away combustion heat and keeps the pistons and cylinders from being damaged. When it gets hot enough, the thermostat opens to send water through the radiator, where it's cooled by the air, then recirculated. Air-cooled engines need no water, but the condition of the fan belt is critical.

Most modern cars use a half-and-half mixture of water and glycol antifreeze to help prevent freezing, overheating and rust.

Q. How can a car ride smoothly on a bumpy road?

A. That's the magic of the suspension system.

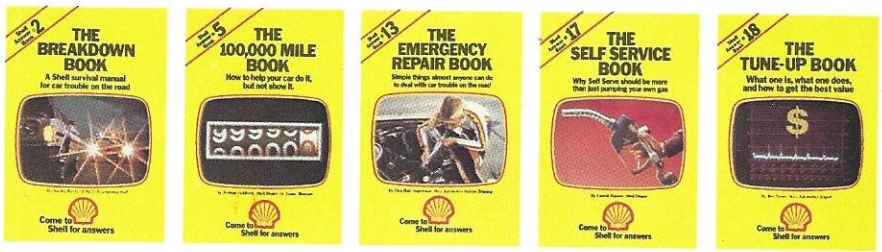
Cars today have "independent suspension" in front. This means each wheel is independently supported and sprung, so a bump at one wheel is not transmitted to the other.

Springs support the car's body

and keep it fairly level by compressing and rebounding to allow up-and-down wheel movement. "Sway bars" keep the car from leaning too much on curves. Shock absorbers reduce bouncing. If you notice prolonged bouncing after hitting a bump, have your shocks replaced.

Q. Any more questions?

A. If you have other questions about how your car works, you can check out excellent manuals at your library, ask your mechanic, or write to me: Howard Schmitz, Shell Oil Company, P.O. Box 61609, Houston, Texas 77208.


No. 2
THE BREAKDOWN BOOK
A Shell survival manual for car trouble on the road
Come to Shell for answers
No. 15
THE 100,000 MILE BOOK
How to help your car do it, but not show it.
Come to Shell for answers
No. 13
THE EMERGENCY REPAIR BOOK
Simple things almost anyone can do to deal with car trouble on the road
Come to Shell for answers
No. 17
THE SELF SERVICE BOOK
Why Self Serve should be more than just pumping your own gas
Come to Shell for answers
No. 18
THE TUNE-UP BOOK
What one is, what one does, and how to get the best value
Come to Shell for answers

How to get more answers from Shell. *These and other Shell Answer Books are available at many Shell dealers. Or you can write Shell Answer Books, P.O. Box 61609, Houston, Texas 77208.*

Are you using the right oil?

Put Shell Fire & Ice® in your engine and stop worrying. It helps protect your engine from 10° below zero to 100° above. And it's been reformulated to give you even better gas mileage than before. Diesel owners: Shell single weight X-100 is the recommended grade for virtually all passenger car diesels.

Come to Shell for answers

HOW TO BUY TIRES WISELY

Caution, be on the alert for those unseen tire injuries. Some words to the wise from Shell's long-time expert on tires, John Thomas.

I don't have to tell you that you'll get the most from your tires through commonsense care, proper air pressure, and good driving habits. For instance: you probably already know that low air pressure will shorten the life of your tires. (See detailed tips for making tires last longer on following pages.)

But I want to warn you about some sneaky enemies: Unseen Tire Injuries. If you're like most drivers, you're oblivious to them. I'm very much aware of them because I have seen how damaging they can be.

For instance: hitting a chuckhole or any other obstacle sounds like an innocent enough occurrence. It happens to the best of drivers. And there's seldom any evidence that something has gone wrong.

But if the impact is hard enough, it can cause a tire to fail 500 or 5000 miles later. And with enough time in between to help you forget that you damaged the tire yourself. So the complaints fly about faulty construction. When that isn't the problem at all.

There is yet another concern that I'd like to clear up for you. You may have heard that premium tires such as radials fail more often than lesser grades. That is absolutely correct. But there's a simple explanation. They're on the road so much longer. And this longer road life just about doubles their exposure to hazards. So if you've invested in premium tires, be doubly alert in caring for them. It'll pay off in protection for your investment.

Nobody hits chuckholes or rocks on purpose. But if you whack one unavoidably, put yourself on the alert. Obvious damage might show up in the form of a bulge in the sidewall or tread.

What you have to be really alert for is any invisible damage. The telltale sign of this might be tire wobble, a bumpy ride, or steering wheel shimmy.

Please do me and yourself a favor. At the first sign of irregularity in your tires, drive to the nearest Shell Dealer and have the tire thoroughly inspected. You'll be glad you did.

Thank you. Save this and the tips which follow. It's all worth reading more than once.

John P. Thomas

P.S. If you have any questions, write me: c/o Shell Oil Company, P.O. Box 61609, Houston, Texas 77208.

Save these valuable tips from your Shell Dealer. They'll help you make a wise choice the next time you're buying tires (Shell tires or any other brand).

1. Know what you're buying

Read this to refresh your memory of the three most popular tire constructions on the market. Then you won't feel snowed or puzzled by all the technical terms used to describe tires.

Bias-ply construction — made with two, four, six or more layers of corded fabric which are known as plies. Note placement of these. The plies run diagonal to the tread — what tailors call "on the bias." Thus the name: bias-ply.

Bias-ply tires are noted for a softer, more comfortable ride than other constructions.

Bias-belted construction — made with two or more plies of cord running diagonally to the tread. Then reinforced with bias-cord belts running the same direction as the tread. (See illustration.)

The belts reduce tread squirm. And this gives you longer wear than you get from non-belted tires.

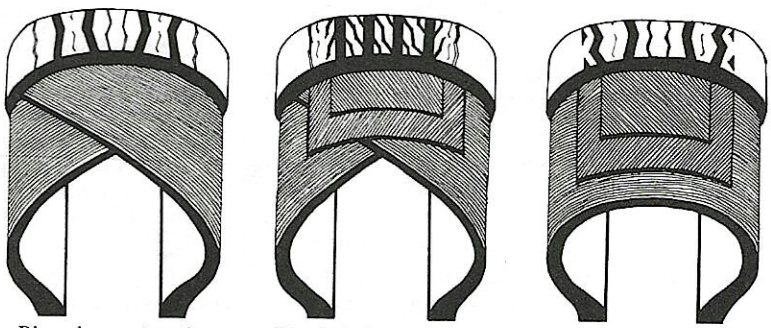
Radial construction — made with the plies running radially, or at a 90° angle to the tread. In addition, there are two or more bias-cord belts which run in the same direction as the tread.

Radials run more easily, have less rolling resistance. This gives you better gasoline mileage and helps you get longer tire life. Radials are also known for faster, surer steering response.

Note: when you hear fiber names used in describing construction, they're telling you what the corded plies are made of—rayon, nylon, polyester, fiberglass, aramid and *steel.*

2. Determine your price range

The more you plan your tire purchase, the more it becomes a *considered* action instead of an impulse buy. And the better off you'll be. Make up your



Bias-ply construction *Bias-belted construction* *Radial construction*

mind on what you want from a tire—a short-term investment that'll see you through until trade-in time next year—or a tire that'll serve you for 40,000 to 50,000 miles?

You generally get what you pay for—in tires, as in almost everything else.

So your budget shouldn't be the sole consideration. You must also take into account the way you drive, the amount you drive, and the lifespan you expect from the tires.

If you need the best, it doesn't make sense to compromise on a lesser quality. You'll wind up paying more over the long haul.

3. Which for you? Good, better or best?

We present the Shell lineup of tires below for two reasons. (A) To show that we, like most other major brands, have something for everyone. And (B) to do a very little bit of low-key selling — it's the only attempt at salesmanship we'll make here.

Good — Bias-ply constructions.
Like the Shell Comfort Ride™ which has four full plies of polyester cord.

Better — Bias-belted constructions.
Like the Shell Belted 78 which has two body plies of polyester, plus two belts of fiberglass.

Best — Radial construction.
Shell has two in this category: the economy-priced Radial Ride and the Shell® Steel-Belted Radial.

Moving up in quality usually means moving up in price. Wider profiles and bigger sizes will also result in higher prices. Your Shell Dealer can help you decide which tire is right for your driving needs and which size is correct for your car.

4. Be sure you're reading your tires right

Understanding all the letters and numbers on the sidewall is important. (And it's *vital* when you're not ordering a whole set of replacement tires. Be sure your new ones have the same capabilities and are the same size as the ones you're teaming them with.)

The size. The tire sketched is a GR 78-15. And everything means something.

The "G" designates the weight this size is designed to support. Other weight designations run from A through N.

The "R" tells you it's of radial construction. (If there's no "R", it's a bias-ply or bias-belted construction.)

The first part of the number "78" tells you the tire's profile or width. (Technically the "78" gives the aspect ratio of the cross-section height to the width of the tire. This one is 78 percent as high as it is wide.)

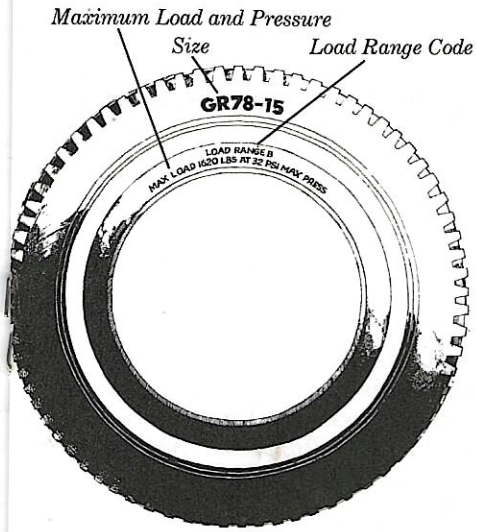
The second part of the number, "15", means it fits a 15-inch rim.

The load range code. These letters represent the inflation limits of the tire. The higher the letter, the higher the maximum air pressure limit, and the higher the load the tire can carry.

Here's how it works:

A = 28 p.s.i. C = 36 p.s.i.
B = 32 p.s.i. D = 40 p.s.i.

The recommended air pressure for your car is listed in your owner's manual, on your doorjamb, or on the inside of your glove compartment door.



You'll note there's a higher pressure recommended for carrying heavy loads or for driving at turnpike speeds. But experience tells us that few people bother with changing the air pressure back and forth. Therefore, Shell suggests using the higher pressure at *all* times.

It may make for a slightly harder ride. But your tires will be far less likely to suffer any damages from heat buildup caused by underinflation.

Maximum load and pressure. This figure is the maximum weight the tire can carry when inflated to full pressure. Four tires such as this one will support a car and load of up to 6,480 pounds (4 x 1, 620).

Nobody can be expected to remember all of this size nomenclature. So why not just save this booklet for future reference. It'll fit very conveniently into your glove compartment.

5. Should you wait for a sale?

By all means, wait for a bargain if you can. And if you do plan your purchase, you'll probably catch a sale.

Some retailers trot out one type of tire at a time for special events.

You'll be happy to know that Shell tires go on sale — *twice* a year, spring and fall, at participating Shell stations. That should help you with your planning.

6. Ask where you have to go for service on the warranty

The more you read warranties, the more you realize that they're very much alike in what they cover.

So a good thing to check out is the *acceptability* of your warranty. If the dealer who issued it is the only one who will honor it, you're out of luck if you can't get to him.

The advantage of a Shell warranty is very simple. It is honored at thousands of participating Shell stations across the U.S.A.

7. A half dozen tips for making your new tires last longer

Save this booklet until you've made your wise choice of new tires.

- Check air pressure monthly. Underinflation is tire enemy number one.
- Have the front end alignment checked when you buy new tires. Have wheels balanced, too.
- Regular rotations will help distribute the wear so rotate tires every 6000 to 8000 miles.
- Keep air pressure at the maximum recommended — but never go a pound beyond.
- Be moderate in your driving. No aggressive take-offs or panic stops.
- Get in the habit of giving your tires the once-over regularly. How about every time you stop for gasoline.

Shell Tire and Tube Limited Warranty

This warranty is extended only to you, the original purchaser of the tire, for as long as it remains on the vehicle on which it was originally installed. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state. This warranty is designed to allow you a credit toward a new Shell tire for the amount of usable tread remaining on the tire you purchased at the time the tire becomes unserviceable.

What Is Warranted and For How Long

1. Passenger Tires

All new Shell passenger tires are warranted as serviceable for operation in normal highway use, according to the following schedule:

(a) If a Shell steel radial tire becomes unserviceable *during the first 12 months after date of purchase or during the first 3/32" of tread wear, whichever comes first, Shell will replace the tire without charge.*

(b) If any other Shell passenger tire becomes unserviceable during the first 1/32" of tread wear, Shell will replace the tire without charge.

(c) If either a steel radial or other Shell passenger tire becomes unserviceable after the periods outlined in (a) and (b) above, Shell will give you a credit toward the purchase of a new Shell tire. The amount of this credit is determined by multiplying the percent of the original usable tread remaining by Shell's existing adjustment base price for the particular tire.

For Purposes Of This Warranty

"Usable tread" is defined as that amount of the original tread which remains down to the tire tread wear indicators, to 2/32". (Any tire with a remaining tread of less than 2/32" is considered as worn out by the Department of Transportation.) The remaining tread depth is measured by taking the average of at least three depth readings from around the tire in the widest groove nearest the center of the tire.

"Unserviceable" means that a tire cannot sustain its proper pressure under normal conditions and cannot be repaired.

2. Truck Tires

All new Shell truck tires are warranted as serviceable under normal conditions of use.

If a truck tire becomes unserviceable, Shell will give you a credit toward the purchase of a new Shell

truck tire. The amount of the credit is determined by multiplying the percent of original usable tread remaining by Shell's existing adjustment base price for the particular tire.

3. Passenger and Truck Tubes
All new Shell passenger and truck tubes are warranted as serviceable for the life of the tube. If a tube becomes unserviceable, other than as a result of a road hazard after purchase, Shell will replace the tube with a comparable Shell tube.

What Is Not Covered By This Warranty

The warranty does not cover any of the following for either passenger or truck tires:

- Tires transferred from the vehicle on which they were mounted;
- *Tires rendered unserviceable by a road hazard or road conditions that cause cuts, snags, non-repairable punctures or bruises, including body breaks or blowouts caused by such road hazards or road conditions.*
- Tires that have been recapped or regrooved;
- Tires damaged by fire, theft, vandalism, wrecks or collision, tires with premature or irregular wear or damage due to improper inflation, overloading, mechanical condition of the vehicle, misalignment or repairable punctures;
- Tires branded BLEM for ride, balance or appearance;
- Tires on vehicles normally operated outside the Continental United States, Alaska, Hawaii or Canada;
- Tires that are "out of round" after the first 2/32 inch of tread wear;
- Tires damaged by willful abuse, obstruction on vehicle or tire chains.

In addition to these items, there are certain other exclusions applicable to the following tires:

1. Passenger Tires
Tires used on special-application vehicles (such as light trucks, pickup trucks, vans, trucks, or recreational vehicles) or in commercial applications (such as police or taxi service) or in racing or off-the-road service.

2. Truck Tires

- Cuts, snags and punctures, including body breaks or blowouts caused by such cuts, snags or punctures.
- Tires used in racing or off-the-road service.

No Shell representative, employee or independent dealer has authority to make any representation, promise or agreement beyond the terms noted in this warranty. The warranty does not extend in any way to consequential damages including loss of time, inconvenience, loss of use of vehicle. Some states do not allow the exclusion or limitation of incidental or consequential damages, so this exclusion may not apply to you.

How to Obtain Warranty Service

Warranty service is available through participating Shell service stations

where Shell tires are sold in most parts of the U.S.

Not all of Shell's independent dealers participate in providing this service. To find out if a particular Shell Dealer is participating, please refer to your local Yellow Pages Directory under the listing "Service Stations" — we suggest that you call first. If you are unable to locate a participating Shell Dealer, call our toll-free number for assistance: (800) 331-3703.

Your Obligations as Purchaser

You are responsible for routine maintenance such as maintaining correct cold tire inflation pressure, balancing, alignment and avoidance of vehicle overloading.

To obtain warranty service you must present the tire to a participating Shell Dealer along with this warranty certificate.

You must pay applicable, Federal manufacturer's excise tax and all applicable local taxes and the adjusted price of a new tire, retailer replacement charges such as mounting and balancing (except where such charges may be prohibited by state law), and any additional services you order at time of adjustment such as tire rotation and alignment.

Shell Oil Company
Consumer Relations Dept.
P. O. Box 2463
Houston, Texas 77001